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ABSTRACT

This work is one of a series of monographs on the improvement of engineering education. This particular study was designed to determine: (1) the extent of individual engineers' involvement in continuing education; (2) factors pertaining to job success; and (3) what relationships may exist between the two. The population surveyed included all persons with a bachelor's or higher degree in engineering who were working in an engineering area. Data were obtained by means of a questionnaire. Six factors related to an engineer's success were chosen as dependent variables: (1) years with present company; (2) present job satisfaction; (3) salary increases and promotions; (4) salary with respect to age; (5) salary with respect to job responsibilities; and (6) salary with respect to age and job responsibilities. A list of independent variables were chosen to indicate two types of continuing education: those types which can be measured by participation in programs, and other types which are highly individualized and cannot be measured by participation in programs. Chi square statistics revealed 21 significant relationships between the dependent and independent variables; these findings are discussed at length in the report. Also included are the questionnaire, accompanied by its cover letter, and complete tabulations of individual questionnaire item results. (MLH)

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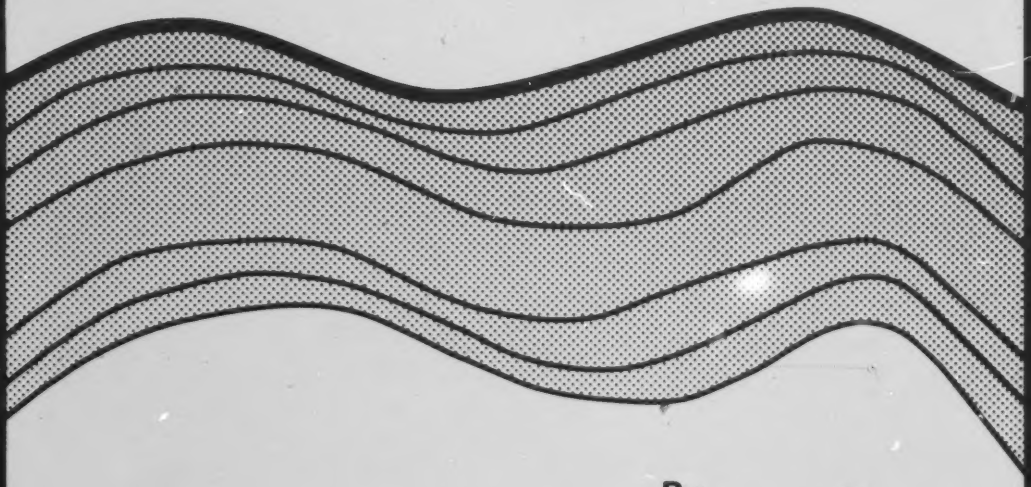
ENGINEERS INVOLVED IN CONTINUING EDUCATION

A Survey Analysis



By
John P. Klus
and
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American Society For Engineering Education

ENGINEERS INVOLVED IN CONTINUING EDUCATION

A Survey Analysis

By
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and
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4

FOREWORD

The American Society for Engineering Education is pleased to publish this work as one of its series of monographs on the improvement of engineering education. Although the Society's principal interest is in engineering education, it is ASEE's intent that the monographs serve all areas of education, describing either subject matter or techniques which will be of interest to those engaged in educational work.

Continuing education is a most important aspect of a professional person's life. Due to the rapidity with which technological advances occur, education is necessary on a continuing basis in order to maintain a current knowledge of one's field and to be able to contribute effectively to the solution of today's problems. Educators in the field of adult education, as well as employers of engineers, are vitally concerned with knowing more about the people who participate in continuing education — who they are; what motivates them; and the value of continuing education for their job performance.

This monograph investigates these questions, and should provide the reader with increased insight into the problems of determining the need for continuing education for the practicing engineer and determining the benefits gained by the practitioner when he becomes involved in a formalized continuing education program. Job success, job satisfaction, and the value of continuing education to the practicing engineer are evaluated in relation to company size, promotion, geographic location and other variables. This monograph, based on a survey conducted by Judy A. Jones, is an outgrowth of the work of John P. Klus in his capacity as chairman of a UNESCO international working group on continuing education.

We believe this monograph will be of interest to engineers, employers of engineers, and, in particular, professional educators who will find it an aid in determining the needs of adults for continuing education.

Lawrence P. Grayson
Joseph M. Biedenbach
March 6, 1975

PREFACE

At a FEANI/Unesco conference on continuing education for engineers at Helsinki, Finland during the summer of 1972, it was recommended that a Working Group on this subject be formed in Unesco to study the problems of continuing education for engineers and report solutions. The Division of Technological Research and Higher Education of Unesco, under Dr. A. Estafiëv, established the group in the spring of 1973. The following members make up the group:

Professor Moussa Bamba
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Ivory Coast

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CONTENTS

PREFACE v

LIST OF TABLES ix

LIST OF FIGURES xv

CHAPTER 1. OVERVIEW 1
Summary 1
Implications 3

CHAPTER 2. INTRODUCTION 4
Statement of Problem 4
Need for Study 4

CHAPTER 3. PROCEDURES 9
Design 9
Method 13
Initial Tabulation 16
Definition of Terms 22
Scope 22

CHAPTER 4. FINDINGS 23
Conclusions 23
Results 24
Independent Variable Eight — Overall Participation in Continuing Education 29
Independent Variable Three — Participation in In-house Programs 50
Independent Variable Four — Participation in University Noncredit Programs 53
Independent Variable Five — Participation in Professional Society or Government-sponsored Programs 56
Independent Variable Two — Emphasis Placed on Establishing Professional Relationships 60
Dependent Variable Two — Job Satisfaction 64

APPENDIX A — Questionnaire 73

APPENDIX B — Initial Tabulation of Survey 80

At a meeting in Paris in June, 1973, problems of continuing education for engineers were analyzed and projects to be completed by Working Group members were recommended. This survey analysis is a contributing study for Project No. 1, entitled "Establishing a Case for Continuing Education," which was recommended at the 1973 Paris meeting.

In Project No. 1, the economic and social value of continuing education was assessed. The benefits of education to several groups — nations, professions, employers, individuals — were considered. The value of education as an investment in national development was shown through international statistical studies and current educational efforts. Professions, including engineering, were found to rely on continuing education to aid in maintaining and advancing their standards of practice. Although employers reported continuing education to be beneficial to their companies, no statistical evidence was available to support this assertion.

The major effort in the study was directed toward assessing the benefits to individuals of continuing education. A preliminary step in this assessment was a review of the literature in the field. The assessment itself consisted of the survey reported here, whose purpose was to determine whether a correlation exists between continuing education and factors involving job success among engineers. This research was carried out by Ms. Jones and the major portion appears in her M.S. thesis.

One of the surprises of this survey was that the participants in University of Wisconsin—Extension Engineering programs were, on the whole, average engineers. We had assumed that people attending university programs were generally the better paid, top performers. This information, along with the general results and conclusions, allows us to project more accurately the level our courses should reach and to understand the importance of continuing education. The results of our study provided interesting information on a number of other topics that were incidental to the major thrust of the survey; one of particular interest was job satisfaction.

The information gained from this report is a starting point for studies of persons involved in continuing engineering studies. We need, however, to know more in order to provide effective continuing education.

J. P. K.
J. A. J.

Madison, Wisconsin
October, 1974

LIST OF TABLES

1. Question: What is the approximate number of people employed by your company, including all divisions? 17

2. Question: What is the approximate number of engineers employed in your division only? 18

3. Age of respondents, by category and percent. 18

4. Activities in which engineers might be engaged; present degree of involvement by respondents. 19

5. The relationship between respondents' participation in university-sponsored programs and in professional society or government-sponsored programs. 19

6. The relationship between overall participation in continuing education programs and salary with respect to age among all respondents. 30

7. The relationship between overall participation in continuing education programs and salary with respect to age among those respondents whose companies placed an overall low emphasis on continuing education programs. 31

8. The relationship between overall participation in continuing education programs and salary with respect to age among those respondents whose companies placed an overall average emphasis on continuing education programs. 32

9. The relationship between overall participation in continuing education programs and salary with respect to age among those respondents whose companies placed an overall high emphasis on continuing education programs. 32

10. The relationship between overall participation in continuing education programs and salary with respect to age among those respondents who placed an average value, in terms of career advancement, on past participation in continuing education programs. 34

11. The relationship between overall participation in continuing education programs and salary with respect to age among those respondents who placed a high value,

LIST OF TABLES (continued)

in terms of career advancement, on past participation in continuing education programs. 34

12. The relationship between overall participation in continuing education programs and salary with respect to job responsibilities among all respondents. 35

13. The relationship between overall participation in continuing education programs and salary with respect to job responsibilities among those respondents whose companies placed a low emphasis on continuing education programs. 36

14. The relationship between overall participation in continuing education programs and salary with respect to job responsibilities among those respondents whose companies placed an average emphasis on continuing education programs. 37

15. The relationship between overall participation in continuing education programs and salary with respect to job responsibilities among those respondents whose companies placed a high emphasis on continuing education programs. 38

16. The relationship between overall participation in continuing education programs and salary with respect to job responsibilities among those respondents who placed an average value, in terms of career advancement, on past participation in continuing education programs. 38

17. The relationship between overall participation in continuing education programs and salary with respect to job responsibilities among those respondents who placed a high value, in terms of career advancement, on past participation in continuing education programs. 39

18. The relationship between overall participation in continuing education programs and salary with respect to age and job responsibilities among all respondents. 40

19. The relationship between overall participation in continuing education programs and salary with respect to age and job responsibilities among those respondents whose companies placed an overall low emphasis on continuing education programs. 41

LIST OF TABLES (continued)

20. The relationship between overall participation in continuing education programs and salary with respect to age and job responsibilities among those respondents whose companies placed an overall average emphasis on continuing education programs. 42

21. The relationship between overall participation in continuing education programs and salary with respect to age and job responsibilities among those respondents whose companies placed an overall high emphasis on continuing education programs. 43

22. The relationship between overall participation in continuing education programs and salary with respect to age and job responsibilities among those respondents who placed an average value, in terms of career advancement, on past participation in continuing education programs. 44

23. The relationship between overall participation in continuing education programs and salary with respect to age and job responsibilities among those respondents who placed a high value, in terms of career advancement, on past participation in continuing education programs. 44

24. The relationship between overall participation in continuing education programs and salary increases and promotions among all respondents. 45

25. The relationship between overall participation in continuing education programs and salary increases and promotions among those respondents whose companies placed an overall low emphasis on continuing education programs. 46

26. The relationship between overall participation in continuing education programs and salary increases and promotions among those respondents whose companies placed an overall average emphasis on continuing education programs. 47

27. The relationship between overall participation in continuing education programs and salary increases and promotions among those respondents whose companies

LIST OF TABLES (continued)

placed an overall high emphasis on continuing education programs. 47

28. The relationship between overall participation in continuing education programs and salary increases and promotions among those respondents who placed an average value, in terms of career advancement, on past participation in continuing education programs. 48

29. The relationship between overall participation in continuing education programs and salary increases and promotions among those respondents who placed a high value, in terms of career advancement, on past participation in continuing education programs. 49

30. The relationship between overall participation in continuing education programs and job satisfaction among all respondents. 49

31. The relationship between participation in in-house programs and salary with respect to age among all respondents. 51

32. The relationship between participation in in-house programs and salary with respect to job responsibilities among all respondents. 52

33. The relationship between participation in in-house programs and salary with respect to age and job responsibilities among all respondents. 52

34. The relationship between participation in university noncredit programs and salary with respect to age among all respondents. 53

35. The relationship between participation in university noncredit programs and salary with respect to job responsibilities among all respondents. 54

36. The relationship between participation in university noncredit programs and salary with respect to age and job responsibilities among all respondents. 55

37. The relationship between participation in university noncredit programs and salary increases and promotions among all respondents. 56

LIST OF TABLES (continued)

38. The relationship between participation in professional society or government programs and salary with respect to age among all respondents. 57

39. The relationship between participation in professional society or government programs and salary with respect to job responsibilities among all respondents. 58

40. The relationship between participation in professional society or government programs and salary with respect to age and job responsibilities among all respondents. 58

41. The relationship between participation in professional society or government programs and salary increases and promotions among all respondents. 59

42. The relationship between participation in professional society or government programs and job satisfaction among all respondents. 60

43. The relationship between the emphasis placed on establishing professional relationships and salary with respect to age among all respondents. 61

44. The relationship between the emphasis placed on establishing professional relationships and salary with respect to age and job responsibilities among all respondents. 62

45. The relationship between the emphasis placed on establishing professional relationships and salary increases and promotions among all respondents. 62

46. The relationship between the emphasis placed on establishing professional relationships and job satisfaction among all respondents. 63

47. The relationship between total company employment and job satisfaction. 64

48. The relationship between engineering staff size and job satisfaction 65

49. The relationship between salary level and job satisfaction. 65

50. The relationship between salary for job responsibilities and job satisfaction. 66

LIST OF TABLES (continued)

51. The relationship between salary increases and promotions and job satisfaction. 67

52. The relationship between level of supervisory responsibility and job satisfaction. 67

53. The relationship between level of technical responsibility and job satisfaction. 68

54. The relationship between overall company emphasis placed on continuing education and job satisfaction. 69

55. The relationship between company emphasis placed on providing released time for attending credit courses and job satisfaction. 70

56. The relationship between company emphasis placed on professional society or government-sponsored programs and job satisfaction. 71

57. The relationship between company emphasis on in-house programs and job satisfaction among all respondents. 71

58. The relationship between company emphasis on university noncredit programs and job satisfaction. 72

LIST OF FIGURES

1. Enrollments: University of Wisconsin—Extension Engineering from July 1, 1972 to June 30, 1973. 14

2. Relationship between respondents' age and participation in continuing education programs. 20

3. Relationship between respondents' length of employment with present company and average participation in continuing education programs. 21

4. Summary of significant relationships between the dependent and independent variables. 25

5. Relationship between overall participation in continuing education programs and median salary adjusted for age and job responsibilities among all respondents. 26

6. Relationship between total company employment and job satisfaction. 27

7. Relationship between overall company emphasis on continuing education and satisfaction with present job situation. 28

Chapter 1

OVERVIEW

This chapter provides an overview of the survey of engineers involved in continuing education that supplied the data on which this report is based. In the remaining chapters, the experiment design and method, data, conclusions, and results are described in detail.

SUMMARY

The Survey

The survey was conducted in March 1974 under the auspices of the University of Wisconsin—Extension Department of Engineering. The engineers surveyed were participating in University of Wisconsin —Extension continuing engineering education programs. Respondents returned 257 usable questionnaires.

Conclusions

Analysis of survey results produced the following conclusions:

A. Combined participation in continuing education programs seems to have a positive effect on those job factors pertaining to salary and on satisfaction with present job situation.

B. The relationships involving company emphasis on continuing education seem to suggest that even without a company's backing, those engineers who seek out continuing education are more successful in terms of salary.

C. The emphasis an engineer places on establishing professional relationships appears to be a positive factor in his job success.

D. Reading professional journals appears to be an easily accessible, basic method necessary for an engineer to maintain his place in the profession.

E. An engineer's participation in continuing education did not seem to have any effect on his length of employment with his present company.

F. Engineers from smaller companies tended to be more satisfied with their job situation.

G. Engineers employed by companies placing more emphasis on continuing education tended to be more satisfied with their job situation.

The Sample

The following are some major characteristics of the respondents:

A. Number of employees in respondents' companies:
   1. 100 and under—15%.
   2. 101 to 1000—19%.
   3. 1001 to 5000—24%.
   4. Over 5000—42%.

B. Age:
   1. 20 to 29—23%.
   2. 30 to 39—41%.
   3. 40 to 49—24%.
   4. 50 to 62—12%.

C. Engineering activities respondents were most highly involved in:
   1. Management—engineering, production, project.
   2. Planning—long or short range.
   3. Project engineering.
   4. Specifications—codes, standards.
   5. Design and drafting.
   6. Research and development.
   7. Manufacturing engineering.
   8. Training and/or evaluation of personnel.

D. 21% were earning above the median salary for their age; 62% were earning the median; 16% were earning below the median.

E. 29% were earning above the median salary for their job responsibilities; 52% were earning at the median; 18% were earning below the median.

F. 55% stated they were above average in satisfaction in terms of present job situation.

Continuing Education Experience

Respondents' experiences with various aspects of continuing education were found to be as follows:

A. Individualized methods of continuing education:
   1. 54% placed above-average emphasis on reading current engineering and technical literature.
   2. 37% placed above-average emphasis on establishing professional relationships with engineers in other companies for the informal exchange of information as problems arise.

B. Participation in continuing education programs within the two years preceding the survey:
   1. 18% had taken at least one credit course.
   2. 74% had participated in some type of in-house educational program.

3. 52% were attending their first university program.
4. 55% had participated in a professional society or government-sponsored program.

C. Attitudes toward continuing education:
   1. Respondents' view of company attitude:
      a. 21% were employed by companies which placed an overall high emphasis on continuing education.
      b. 52% in companies with an overall average emphasis.
      c. 24% in companies with an overall low emphasis.
   2. Individual respondents' attitudes:
      a. 18% placed an overall high value, in terms of career advancement, on past participation in continuing education programs.
      b. 43% place an overall average value.
      c. 30% placed an overall low value.

IMPLICATIONS

This study has shown that some types of continuing education are related to the job success of an engineer. However, further research in this area is needed. A method of measuring involvement in individualized continuing education should be developed. Job factors, other than monetary, which contribute to an individual's job success, and means of evaluating such factors need to be established. Because of the variables involved in job success, a study with testing at intervals of several years might provide better assessment of the relationships between continuing education and job success.

To corroborate this study, a larger and more representative sample of the total engineering population would be particularly valuable. With a larger sample, variation in areas of responsibility and activities could be examined with regard to continuing education, job satisfaction, and other factors. Much more must be known if the right kind of continuing education is to be provided in the most effective manner.

Chapter 2

INTRODUCTION

STATEMENT OF THE PROBLEM

Continuing education is an integral part of engineering education and almost as old as engineering education itself. Sponsors of continuing engineering studies (CES) include industry, government, professional societies, academic institutions, and private organizations. Large numbers of engineers participate in CES programs, but not all do. Many agree that the major benefactor is the employer, but little is known about the ratio of, or even if there is, benefit to either employer or employee resulting from continuing education. Therefore, the purpose of this project is to determine whether there is a relationship, among a selected group of engineers, between participation in continuing education and certain success-related job factors.

NEED FOR THE STUDY

In the late 1940s, technology began increasing at an exponential rate. As engineering applications spread, colleges responded with expanded curricula and a growing number of graduates. When engineers graduated, they were usually competent in their specialized field. Once on the job, their competence needed to be maintained. For many it was not, and the result was the recognition, in the mid 1960's, of the problem of obsolescence. Writers in engineering journals[1,2,3,4,5] discussed obsolescence at length, and one attempted to quantify the problem. In 1969, Steven Zelikoff[6] defined obsolescence as the erosion of the applicability of knowledge. He demonstrated this by analyzing course offerings for five engineering colleges from 1935 to 1965 at five-year intervals. By identifying courses that were dropped and added, he developed erosion curves for five areas of engineering. All areas in recent years had a very steep curve which indicated technological advancement. Obsolescence could, theoretically, be put into an index, as done by Mali.[7] He defined an obsolescence index,

$$OI = \frac{\text{Current knowledge understood by the individual}}{\text{Current knowledge in field.}}$$

Yet another indication of obsolescence was given by Lukasiewicz,[8] who defined **half-life** as the time it takes after completion of professional training for a practicing professional to become half as competent as he was at graduation. He further stated that while the half-life of a

1940 engineering graduate was 12 years, it had shrunk to five years for today's (1971) graduate. A recent informal survey by the Wisconsin section of the American Society of Civil Engineers reported that 83% of those surveyed felt the technology related to their work was changing to a great or moderate extent; 76% found that keeping abreast of this changing technology was necessary either to maintain their present position or to obtain promotions and raises.[9]

Continuing engineering studies have been recognized as a means for personal as well as professional growth. When a person spends at least half his waking hours on the job, it is doubtful that all distinctions between personal and professional growth can be delineated. At the first conference of the CES Division of the American Society for Engineering Education (ASEE), it was stated that any company's responsibility to its employees includes making available the opportunity to grow; this includes an atmosphere which encourages a continuance of learning.[10] Another affirmation of this dual role was stated recently by a vice-president in engineering of a major Western employer. Richard Collins stated that his company's educational efforts have been designed to try to satisfy particular corporate needs, as well as individual employee needs and interests in personal growth and accomplishment.[11] Yet another executive approved CES by stating, "With the broad knowledge that an engineer can gain for himself by additional study, he will develop a better understanding of his own contributions. He can do a better job and increase his value to his company and to society while contributing to his own advancement."[12]

It has been disputed that there is a need for CES. Recently Landis made the following statements following an extensive survey conducted among engineers:

1. CES is not one of the prime concerns of working engineers.
2. Few engineers are challenged to remain highly current in their field or to have a real understanding of engineering principles.
3. Engineers take a very short-range view of CES. They are only interested in offerings that will help them right now, while academicians want to teach understanding and principles.[13]

These criticisms were acknowledged when made in 1969. Since then, replies have been forthcoming. At the 1972 conference of the CES Division of the ASEE, a participant stated:

> Professor Landis expressed these observations before this Division three years ago. Since then engineering employment has been confronted with enough uncertainties so that the attitudes of many engineers are now

more open towards proficiency maintenance. Additionally, "doing their current job better" has neither saved that job nor made re-employment easy for many older engineers.[14]

It has been further stated that part of the third conclusion reached by Landis is no longer valid. Engineers are interested in discipline-oriented programs, however that is no detriment to CES. The principal sponsors and the current nature of their offerings are as follows:

1. **Educational institutions:** Offerings tend to be geographically bounded, discipline-oriented, directed at viable groups of engineers.
2. **Industrial and governmental organizations:** Offerings tend to be state-of-the-art, proprietary, often training for a specific skill, immediate goal oriented, and considered of primary benefit to the organization and of secondary benefit to the individual.
3. **Professional societies:** Their offerings tend to be urban, geographically bounded (but sometimes different from educational institutions), discipline oriented, fundamental or state-of-the-art presentations, and directed at the advancement of the individual.[15]

The expanding field of CES demonstrates that industry, educators, and engineers are interested in continuing education. However, there are many engineers who have not been reached, and one purpose of this study is to identify reasons why an engineer should be interested in continuing education.

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Chapter 3

PROCEDURES

DESIGN

This study was designed to determine:

1. The extent of individual engineers' involvement in continuing education.
2. Factors pertaining to job success.
3. What relationships may exist between the two.

Dependent Variables

The job success of an engineer is dependent on many factors. Some factors are linked to the work environment, while others are part of an individual's drive. Herzberg,[1] Landis,[2] and Barmash[3] have indicated that among these are:

1. Knowledge of specialized area.
2. Ability to work in related fields.
3. Ability to get the job done.
4. Ability to go beyond what is required.
5. Human relations.

Since general education is a part of each of these factors, job success can be related to continuing education.

If an engineer is successful at his job, he should be above the median in certain factors. The selection of these factors was based on a review of literature and on discussions with engineers, engineering managers, personnel directors, and business-management personnel. Some factors were discarded, as information pertaining to them could not be obtained from the respondents themselves. Six factors related to an engineer's success were chosen to represent the dependent variables:

1. Years with present company.
2. Present job satisfaction.
3. Salary increases and promotions.
4. Salary with respect to age.
5. Salary with respect to job responsibilities.
6. Salary with respect to age and job responsibilities.

The first three dependent variables were gathered in the following way. The respondent was asked to state how many **years he had been employed by his present company.** Using a rating scale of one (not satisfied) to five (highly satisfied), the respondent was asked to indicate how he **felt in terms of his present job situation.** The respondent was requested to state the number of **salary increases and promotions** he had received in the past two years.

Dependent variables four, five, and six could not be requested directly. To determine if the respondent was below, at, or above the median **salary for his age,** both age and annual salary were requested. Age was to be stated in years. The respondent was asked to check the one of four categories into which his present annual salary fell. Although actual annual salary would have been more accurate information, it was believed that requesting this would create a hostile attitude in the respondent. The **Professional Income of Engineers 1972** lists the median salary for all ages of engineers in the United States.[4] The respondent's salary category was compared with the median salary for his age to determine whether he was below, at, or above the given median.

Salary with respect to job responsibilities was the fifth dependent variable. Appendix C, "Occupational Definitions," of the **National Survey of Professional, Administrative, Technical and Clerical Pay,**[5] was used in determining the categories of job responsibility. Five levels of supervisory responsibility were listed and the respondent was asked to indicate the one that best described his present job situation. Five levels of technical responsibility were also listed, and the respondent was again requested to indicate the one that best described his present job situation. The respondent's level of technical responsibility and level of supervisory responsibility categorized him in one of the eight levels of engineer's job responsibilities described in Appendix C of the **National Survey.** Table 1[6] in the **National Survey** lists the median salary for each of the eight levels of job responsibilities. The respondent's salary category was compared with the median salary for his level of job responsibility to determine whether he was below, at, or above the median salary.

The last variable, **salary with respect to age and job responsibilities,** was determined from the previous two. Using three points for "above median," two points for "at median," and one point for "below median," the sum of variables four and five was calculated for each respondent. A score of five or six indicated the respondent was above the median salary with respect to age and job responsibilities; four indicated he was at the median; two or three indicated he was below the median.

Independent Variables

Some types of continuing education can be measured by participation in programs; other types are highly individualized and cannot be measured by participation in programs. As the independent variables in this study, a combination of the two categories was chosen:

1. Emphasis placed on reading engineering and technical literature.
2. Emphasis placed on establishing professional relationships.
3. Credit courses.
4. Company in-house programs.
5. University or university extension programs.
6. Professional society or government programs.
7. Correspondence courses.
8. Overall participation in continuing education programs.

Using a rating scale of one (low emphasis) to five (high emphasis), the respondent was asked the emphasis he placed on:

1. Reading engineering and technical literature in relation to other forms of continuing education.
2. Establishing professional relationships for the informal exchange of information as problems arise.

The first was chosen because previous surveys have shown that professionals rely heavily on literature in keeping current. The second was chosen since it was believed that establishing professional relationships was a method of continuing education frequently overlooked.

The respondent was asked to state the number of programs he had attended in the past two years in each of the following:

1. Credit courses, excluding work toward an undergraduate degree.
2. In-house educational (training) courses, seminars, or conferences.
3. University or university extension conferences, institutes, or short courses.
4. Professional society or government seminars, institutes, or short courses.
5. Correspondence courses.

Previous surveys and a review of literature indicated that this list included all common forms of continuing education programs. However, for purposes of determining relationships, low participation in credit courses and correspondence courses dictated that they only be used in the final variable. The last variable, overall participation in continuing education programs, was the total number of programs each respondent participated in.

Control Variables

Although the dependent variables partially describe job success, it was believed that their relationship to continuing education should be examined with respect to certain control variables:

1. Present company emphasis on continuing education.
2. Value of past participation in continuing education.
3. Age.

Landis,[7] Wiegand,[8] and others have stated that an engineer's participation in continuing education depends on his company's attitude. In order to answer such criticisms in relation to this study, it was decided that the respondent would be asked his present company's emphasis on four types of continuing education programs:

1. Educational (training) programs—formal courses, specific content meetings, conferences, intradepartment meetings, etc.—within the company.
2. Company-sponsored programs out of plant—university or university extension programs.
3. Other company-sponsored programs out of plant—professional seminars, government courses, etc.
4. Courses taken for credit at a college or university.

This was done using a rating scale of one (low emphasis) to five (high emphasis) for each category. If continuing education is related to job success, then company emphasis on continuing education should not alter the relationship.

The value a participant placed on his past participation in continuing education was believed to influence the relationship between continuing education and job success. Therefore the respondent was asked the value to him in terms of his career advancement of his past participation in the following:

1. Educational (training) programs within companies.
2. University and university extension programs.
3. Professional seminars, government courses, etc.
4. Courses taken for credit at a college or university.

This was done using a rating scale of one (low value) to five (high value) for each category. If respondents place a low value on past participation in continuing education, then their participation in such programs should not be related to their job success. However, an average or high value on past participation should not alter the relationship, if one occurs.

In comparing participation in continuing education and number of years employed by a company, the age of the respondent must be taken into consideration. The comparison was made in each of the following age groups: 20-29, 30-39, 40-49, 50-62. If participation in continuing education is related to length of employment, then the relationship should hold in each category.

METHOD

Sample

To be eligible for inclusion in the population surveyed, a person had to have a bachelor's or higher degree in engineering and be working in an engineering area. He also had to be a participant in a University of Wisconsin—Extension Engineering program. During 1973-74, the department's program were in the following areas: architectural engineering; chemical engineering; civil engineering; electrical engineering; industrial engineering; mechanical engineering; environmental engineering; package engineering; plant and maintenance engineering; quality control; safety engineering; value engineering.

Sponsorship of the project directed that the population be chosen from University of Wisconsin—Extension Engineering programs. However, this population included both comprehensive engineering disciplines and a national sampling. As seen in Figure 1, the enrollment for the 1972-73 year included participants from all 50 states, the District of Columbia, and several foreign countries. The purpose of the project was such that those participating for the first time as well as those participating extensively in continuing education should be in the population.

Eleven institutes and short courses, two evening noncredit classes, and one Statewide Extension Education Network (SEEN) class, held March 18-29, 1974, were chosen as representatives of various engineering disciplines. All persons who had an engineering degree, who worked in an engineering area, and who were in attendance at the chose programs formed the sample in this study. Of the approximately 417 persons attending these 14 programs, it was estimated that at least 300 would meet the qualification for inclusion in the sample.

Instrument

Several types of data-collection instruments were considered. Personal interview was discarded as involving an excessive amount of time. Pre- and posttesting of participants and of a control group would have been ideal, but would have necessitated a time period of at least one year. A case study of participants and nonparticipants

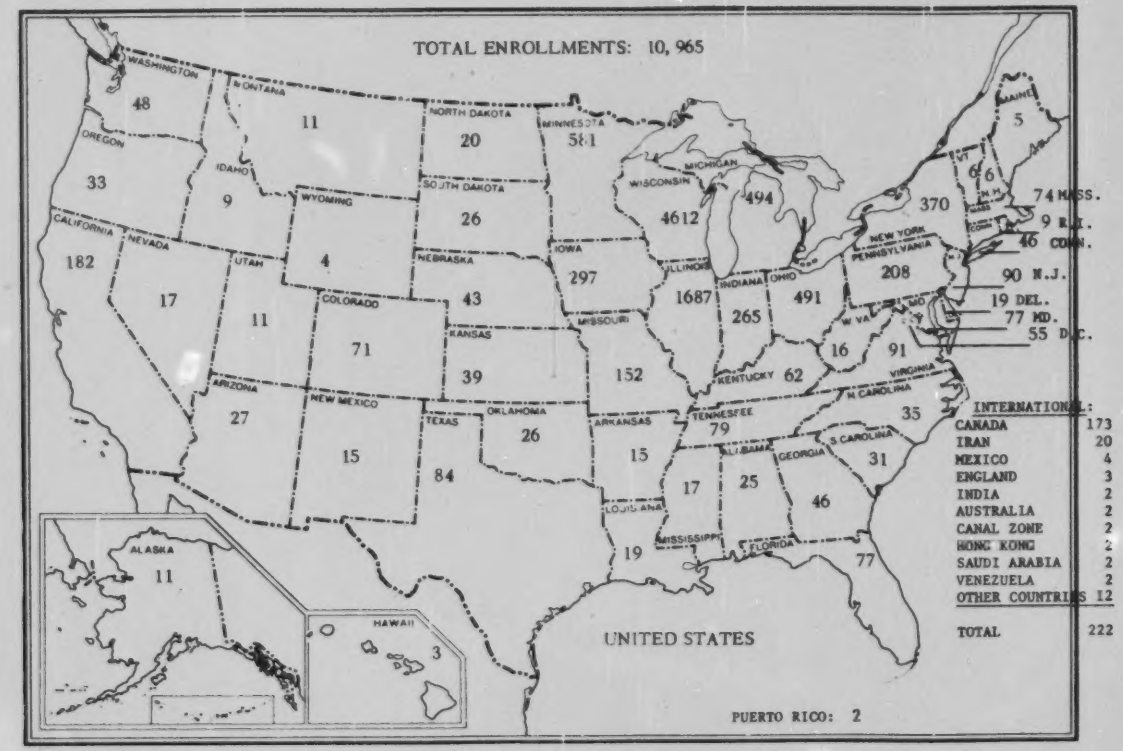

FIGURE 1. Enrollments: University of Wisconsin — Extension Engineering from July 1, 1972, to June 30, 1973.

from one company would have had limited implications. It was believed that a questionnaire would be the best means of gathering the necessary information in the allotted time period. Drawbacks of this instrument include the possibility that respondents may not always give correct answers and the impossibility of verifying answers.

A series of questions was developed to gather information for the variables. The first draft was distributed to several engineers at Extension Engineering for comments on quality, clarity, and questionnaire length. The original questionnaire was revised and shortened to an approximate answering time of 15 minutes. After consultation with the Wisconsin Research Survey Lab, several changes in question wording and position were made. Another draft was prepared and given to all engineers in the department for their comments. When these were received and evaluated, a questionnaire pretest was printed.

Data Collection

The pretest was administered to two groups of engineers enrolled in two institutes. At the first institute, the researcher asked each participant as he registered if he had an engineering degree and was working in an engineering area. If the answer was affirmative, the project was explained, cooperation asked for, and anonymity assured. It was further stated that any participant who would like a copy of the final results should send his request to the Extension Engineering department before the results were published in June. He was then asked to return the questionnaire to the program director at the end of the program day. At the second institute, the program director introduced the researcher before the morning coffee break on the second day. The researcher then explained the project and why it was restricted to those with an engineering degree currently employed in an engineering field. Other directions were as previously stated. Questionnaires were then distributed with the reminder that only those who met the qualifications were requested to complete the questionnaire. Using the latter method assured that all participants in each program would be reached. All participants could not be contacted individually as they registered due to multiple registration lines for larger programs, differences within registration for various programs, and late arrivals. After reviewing both methods of administration, it was decided that the second, group explanation, would be more efficient. This was the administration used at the 14 programs in the sample.

The questionnaire was discussed with several engineers who completed it, and the data were tabulated. Only minor modifications were made before the questionnaire was put into final form. This copy, along with a cover letter similar to one used in a previous

department survey, was sent out for offset printing. Copies of the letter and the questionnaire are in Appendix A. In all, 264 questionnaires were returned, 257 of which were useable.

Statistical Procedures

After the questionnaires were returned, all data were transferred to coding sheets from which one card per respondent was punched. Frequency counts and percentages were computed for each question and each category. In this analysis, to determine whether the various categories of the independent variable differed, the chi square (X^2) procedure was used for each table. Chi square is used when the groups being compared are independent (as opposed to being the same group remeasured), and when the data are grouped into nominal categories (as opposed to ranking the data or assigning numerical values). The X^2 is calculated through the formula $\sum \frac{(O-E)^2}{E}$. **O** is the observed frequency in each table cell. **E**, the expected frequency in each table cell, is based on the row and column marginal totals.

The level of significance is found in a table of chi square values, using the degrees of freedom (**df**). For each table, the df is (R-1) (C-1), where R is the number of rows and C is the number of columns. Significant relationships were those at or beyond the .05 level of confidence. A significance level of .05 indicates that a relationship has a probability of occurring by chance fewer than five times in 100. The Wisconsin Research Survey Lab performed most statistical calculations.

Several abbreviations are used in the tables. **N** represents the total number of responses, usually 257. N_1, N_2, N_3, etc., represent subgroups of N. The number of responses per row is represented by **n**. Total percent occasionally equal 99.9 or 100.1 due to rounding error.

INITIAL TABULATION

Initial tabulation of data indicated the responses from the questionnaire compared favorably with other engineering surveys conducted. The respondents were from companies which employed from as few as ten employees to over 100,000 employees (Table 1). They were members of engineering staffs which ranged in size from only one employee to over 500 (Table 2). The age of participants ranged from 22 to 62, with 40% in the 30-39 category (Table 3). To determine whether respondents represented all engineering disciplines, the respondent was asked for his degree of involvement (highly involved, somewhat involved, not involved) in 19 different engineering activities, with space left for an additional area. As seen in Table 4, all areas were represented. The numerical rankings were calculated by

summing each respondent's answers as follows: one point for each "somewhat involved" mark, two points for each "highly involved" mark. The sample was not large enough to analyze respondents' participation in continuing education programs by the type of engineering activities in which they were engaged. Appendix B contains the remainder of the initial tabulation of data.

The sample included engineers who participate extensively in university and professional programs, as well as engineers who were participating in their first program in the past two years. As seen in Table 5, there was a significant relationship between participation in the two types of programs. Those who were attending their first university institute tended to be those who had not attended a professional society or government program. Those who had attended over three university programs tended to be those who had attended over two professional society or government programs.

TABLE 1

Question: What is the approximate number of people employed by your company, including all divisions? (N=257)

Number	Percent	Employees
19	7.4	under 26
12	4.7	26- 50
7	2.7	51-100
10	3.9	101-200
5	1.9	201-300
15	5.8	301-500
7	2.7	501-750
12	4.7	751-1,000
27	10.5	1,001-2,500
35	13.6	2,501-5,000
24	9.3	5,001-10,000
38	14.8	10,001-25,000
22	8.6	25,001-50,000
14	5.4	50,001-100,000
10	3.9	over 100,000
257	99.9	

TABLE 2

Question: What is the approximate number of engineers employed in your division only? (N=257)

Number	Percent	Engineers
8	3.1	1
30	11.7	2- 5
33	12.8	6-10
39	15.2	11-20
30	11.7	21-30
21	8.2	31-50
10	3.9	51-75
25	9.7	76-100
11	4.3	101-150
20	7.8	151-200
13	5.1	201-500
12	4.7	over 500
5	1.9	No answer
257	100.1	

TABLE 3

Age of respondents, by category and percent. (N=257)

Number	Percent	Category
11	4.3	22-24
47	18.3	25-29
62	24.1	30-34
43	16.6	35-39
32	12.3	40-44
30	11.7	45-49
15	5.9	50-54
17	6.9	55-62
257	100.1	

TABLE 4

Activities in which engineers might be engaged; present degree of involvement by respondents.

Engineering Activity	Involvement
Management—engineering, production, project	112.8
Planning—long or short range	97.3
Project engineering—cost control, purchasing, preparing bids	91.9
Specifications—codes, standards	82.6
Design and drafting	82.4
Research and development	81.6
Manufacturing engineering	73.1
Training and/or evaluation of personnel	70.1
Safety	63.0
Industrial engineering	61.8
Consulting	59.5
Plant layout and/or equipment installation	59.2
Computer utilization and data processing	57.9
Quality control	55.7
Field service engineering—application	44.8
Sales and/or marketing	42.1
Packaging	40.4
Maintenance	38.1
Inventory control—scheduling	33.4
Other	13.2

TABLE 5

The relationship between respondents' participation in university-sponsored programs and in professional society or government-sponsored programs. (N=257)

Number of University or University Extension Programs Attended	Number of Professional Society or Government Programs Attended				
	0	1	2	3 & over	Total
1 (n=134)	57.5%	17.2%	16.4%	8.9%	100.0%
2 (n=62)	40.3%	24.2%	12.9%	22.6%	100.0%
3 & over (n=61)	21.3%	19.7%	27.9%	31.1%	100.0%

(X^2 = 30.97 with 6 df; significant beyond .001)

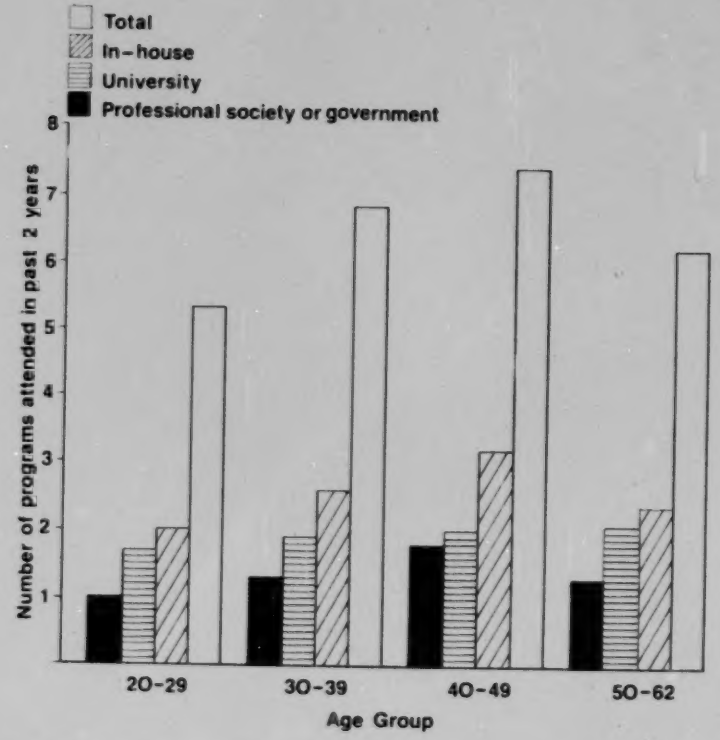

FIGURE 2. Relationship between respondents' age and average participation in continuing education programs.

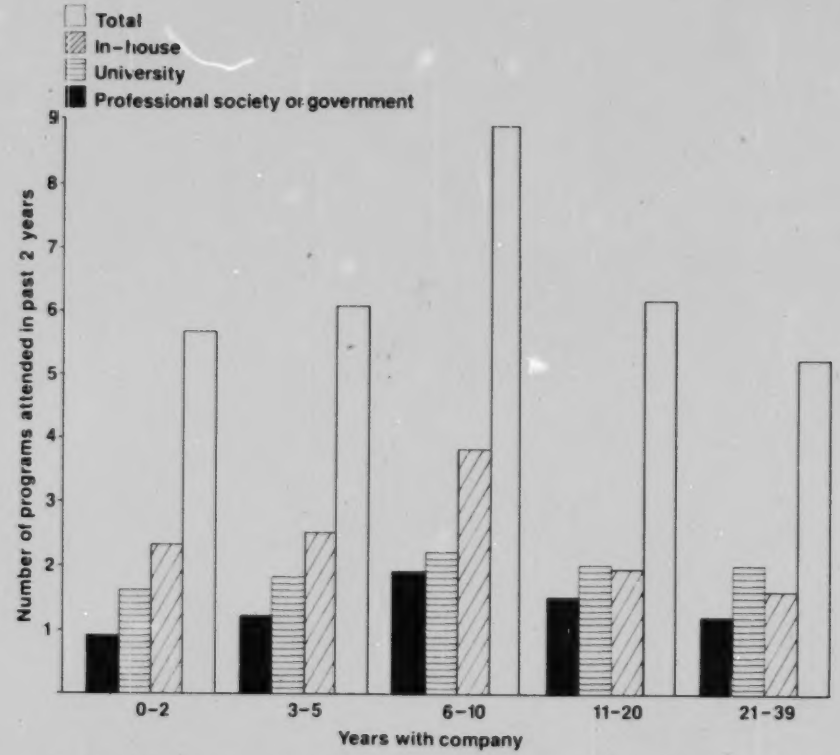

FIGURE 3. Relationship between respondents' length of employment with present company and average participation in continuing education programs.

Figure 2 indicates the average number of continuing education programs that participants in each age bracket attended. Respondents in the 40-49 age range attended the highest average number of programs, 7.4, in the two-year period. Considering **individually** the five forms of continuing education programs surveyed, engineers on the average attended in-house programs more frequently. The same statement held true when participation was broken down into categories of "years employed by present company" (Figure 3). Respondents employed 6 to 10 years attended the highest average number of programs.

DEFINITION OF TERMS

Since this project related involvement in continuing education to job success among engineers, the term **engineer** was defined as follows: An engineer is a person with a bachelor's or higher degree in engineering who is currently working in an engineering area.

Company was used in the questionnaire to indicate the organization in which the respondent might be employed. However, the term **company** might not be accurate for all respondents, since some might be employed by governmental agencies, school organizations, and other organizations.

SCOPE

The scope of this project has been limited by the impossibility of studying all phases of a person's job success. Thus six factors of job success are investigated.

Since the respondents were drawn from a population which included only those currently participating in a continuing engineering education program, the exclusion of nonparticipants may pose a limitation insofar as extrapolation of results to the national engineering population is concerned.

References

[1]Frederick Herzberg, *Work and the Nature of Man*, Chapter 7 (Cleveland, Ohio: The World Publishing Company, 1966).

[2]Landis, *op. cit.*, p. 47.

[3]Isadore Barmash, *The Self-Made Man*, Chapter 6 (New York: The Macmillan Company, 1969).

[4]*Professional Income of Engineers 1972* (New York: Engineers Joint Council, 1972), p. 14.

[5]U.S. Department of Labor, Bureau of Labor Statistics, *National Survey of Professional, Administrative, Technical and Clerical Pay* (Washington, D.C.: U.S. Government Printing Office, 1973), pp. 55-8.

[6]*Ibid.*, p. 14.

[7]Landis, *op. cit.*, p. 51.

[8]Richard Wiegand, "Factors Related to Participation in Continuing Education Among a Selected Group of Graduate Engineers," Ph.D. Dissertation, Florida State University, 1966, p. 74.

Chapter 4

FINDINGS

CONCLUSIONS

Statistical analysis of survey results determined 21 relationships between the dependent and independent variables to be significant (Figure 4). The conclusions reached from these relationships are stated below, with the page numbers of the supporting statistical analyses in parentheses.

Among respondents in this survey, participation during the past two years in institutes and short courses sponsored by universities or professional societies had a high positive relationship with four job factors which involved salary: salary with respect to age (p. 54, 56); salary with respect to job responsibilities (p. 54, 57); salary with respect to age and job responsibilities (p. 55, 57); salary increases and promotions (p. 55, 59). Participation in in-house company programs was related to three of these four factors (p. 50, 51, 52). Since similar relationships occurred in the various types of programs, it was to be expected that total participation in continuing education programs during the past two years had a high positive relationship to the job factors involving salary, and to job satisfaction (p. 29, 35, 39, 43, 49). Due to these similar relationships, it could be said that no one type of continuing education program can contribute more than another to the job success of an engineer. However, combined participation in any continuing education programs does seem to have a positive effect on those job factors pertaining to salary and on satisfaction with present job situation (Figure 5).

The relationship between overall participation and the job factors involving salary was independent of a company's emphasis on continuing education programs. Engineers who participated in more programs tended to be above the median in those factors whether they came from companies which placed high, average, or low emphasis on continuing education programs (p. 30, 35, 40, 45). This seems to suggest that even without a company's backing, those engineers who seek out continuing education programs are more successful in terms of salary.

Overall participation was not related to the four job factors involving salary among those engineers who placed a below-average

837

value on past participation in terms of career advancement (p. 34, 39, 44, 49). Among those respondents who placed an average or above value on past participation, those who participated in more programs tended to be above the median in the salary factors (p. 32, 38, 43, 47). However, in the absence of significant statistical relationships, the effect of this control variable on the relationships between the dependent and independent variables cannot be determined.

Those engineers who placed an above average emphasis on establishing professional relationships tended to be above the median in three of the four job factors involving salary and in job satisfaction (p. 60, 61, 62, 63). These relationships indicate that the emphasis an engineer placed on establishing professional relationships appears to be a positive factor in his job success.

Since the majority of respondents placed a high emphasis on reading professional and technical literature, it could be assumed that this method of continuing education is used extensively. This accepted use of literature as a means of keeping up-to-date could explain why there were no relationships involving reading (p. 63). To maintain his place in the profession, an engineer must have some easily accessible, basic method of satisfying his needs; reading professional journals appears to be such a method.

A relationship was not established between participation in continuing education programs and an engineer's length of employment by his present company. Perhaps engineers place greater emphasis on either a higher salary or greater job satisfaction at a different company than loyalty to a single company.

Several variables were found to be related to job satisfaction. Both total company employment and engineering staff size had a significant relationship with job satisfaction (p. 64). Engineers from smaller companies tended to be more satisfied with their job situation (Figure 6). It appeared that engineers at higher technical and supervisory levels were the ones most satisfied with their current job situation (p. 66, 67, 68). The relationships between an engineer's job satisfaction and the emphasis his company placed on continuing education were also significant (p. 69, 70, 71). Engineers employed by companies placing more emphasis on continuing education tended to be more satisfied with their present job situation (Figure 7).

RESULTS

The dependent and independent variables are described in Chapter 3. To facilitate reading of this chapter, each variable will be briefly

Dependent Variables	Independent Variables					
	Emphasis on reading (1)	Emphasis on professional relationships (2)	Company in-house programs (3)	University noncredit programs (4)	Professional society or government programs (5)	Overall participation (8)
Years employed by company (1)						
Job satisfaction (2)		X			X	X
Salary increases and promotions (3)		X		X	X	X
Salary for age (4)		X	X	X	X	X
Salary for job responsibilities (5)			X	X	X	X
Salary for age and job responsibilities (6)		X	X	X	X	X

X indicates a significant relationship.

FIGURE 4. Summary of significant relationships between the dependent and independent variables.

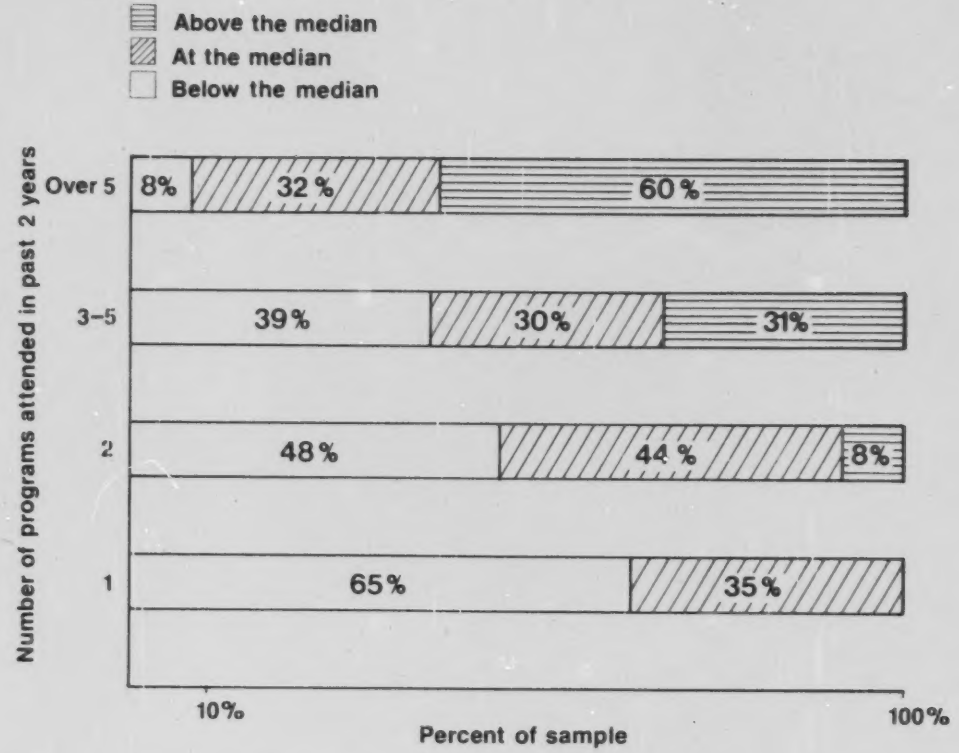

FIGURE 5. Relationship between overall participation in continuing education programs and median salary adjusted for age and job responsibilities among all respondents.

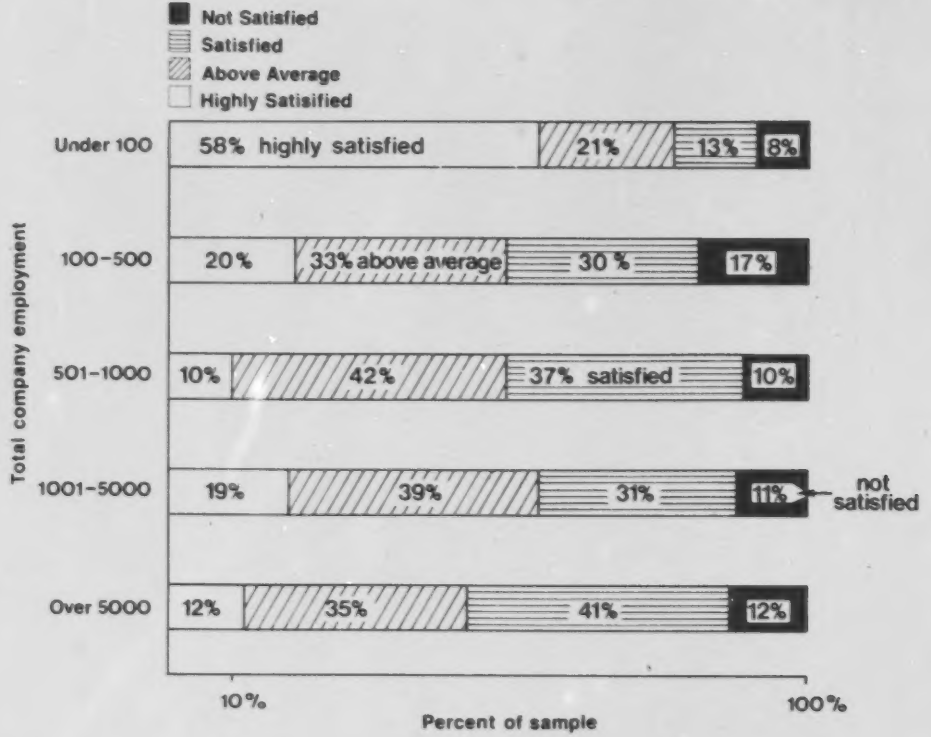

FIGURE 6. Relationship between total company employment and satisfaction with present job situation.

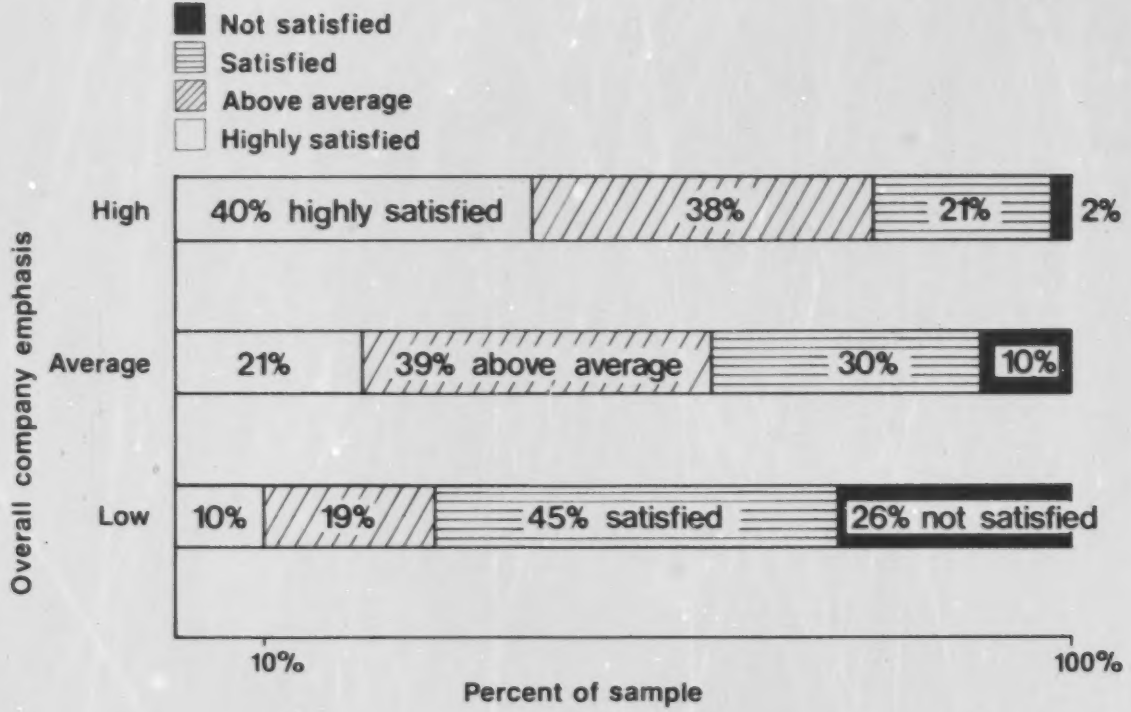

FIGURE 7. Relationship between overall company emphasis on continuing education and satisfaction with present job situation.

described the first time it appears in a relationship. In all, 21 relationships were determined to be statistically significant.

INDEPENDENT VARIABLE EIGHT: OVERALL PARTICIPATION

Overall participation in continuing education programs was related to five of the six dependent variables. For the purposes of this study, overall participation by a respondent was determined by the total number of continuing education programs he had been involved in during the past two years. Of the 257 respondents, 6.6% were attending their first continuing education program in the two-year period; 11.3% had participated in one other program during the past two years; 38.5% had attended between three and five programs; 43.6% had been involved in more than five programs in the two preceding years.

Dependent Variable Four: Salary With Respect to Age

There was a significant relationship between overall participation and salary with respect to age; see Table 6. Each respondent's salary and age was compared to the national median salary for engineers in his age bracket. A respondent was then classed as being below, at, or above the median salary for his age. It was found that 16.3% were below the median; 60.3% were at the median; 20.6% were above the median.

To determine where the significant difference occurred, Table 6 was informally broken down, using chi square with fewer df. There was essentially no difference in salary with respect to age between those respondents who participated in one program and those who participated in two programs. However, those who attended three to five programs differed significantly from those attending fewer programs. Those who participated extensively, attending over five programs, differed significantly from every other category. In both cases, the significant difference occurred between the group below the median and those at or above the median salary for their age. Those who participated in over three continuing education programs in the past two years tended to have fewer below the median salary for their age.

The preceding relationship was independent of the overall emphasis a respondent's company placed on continuing education. The data concerning a company's overall emphasis on continuing education were secured through questions on company emphasis placed on in-house programs and credit course work. A rating scale of one (low

TABLE 6

The relationship between overall participation in continuing education programs and salary with respect to age among all respondents. (N=247)*

Number of Continuing Education Programs Attended Within the Past Two Years	Salary With Respect to Age			
	% above the median	% at the median	% below the median	Total %
Over 5 (n=109)	30.3	65.1	4.6	100
3 to 5 (n=96)	17.7	62.5	19.8	100
2 (n=25)	8.0	48.0	44.0	100
1 (n=17)	0	70.6	29.4	100

(X^2=29.53 with 6 df; significant beyond .001)

*Total N is less than 257 when respondents have not provided relevant information.

emphasis) to five (high emphasis) was used for each question. The average of the numerical values became the data for overall company emphasis. An average of two and one-half or below indicated a company with overall low emphasis on continuing education programs. Companies with overall average emphasis on continuing education programs were those whose numerical value average was greater than two and one-half and less than three and one-half. An average of three and one-half or above indicated a company with overall high emphasis on continuing education programs.

Of the respondents, 25.1% were employed by companies who placed an overall low emphasis on continuing education programs. Compared to those attending their first program in the past two years, those who participated in over five programs had a higher percentage above the median salary for their age. The percentages are given in Table 7. However, statistical analysis using the chi square procedure could not be done since more than 20% of the expected cell frequencies are less than five.[1]

TABLE 7

The relationship between overall participation in continuing education programs and salary with respect to age among those respondents whose companies placed an overall low emphasis on continuing education programs. ($N_1 = 62$)

Number of Continuing Education Programs Attended Within the Past Two Years	Salary With Respect to Age			
	% above the median	% at the median	% below the median	Total %
Over 5 (n=25)	32.0	56.0	12.0	100
2 to 5 (n=33)	12.1	66.7	21.2	100
1 (n=4)	0	75.0	25.0	100

(X^2 not calculated)

Of the 53.4% who reported that their company placed an overall average emphasis on continuing education programs, none of those who participated in under three programs were above the median salary with respect to their age. The relationship as shown in Table 8 is statistically significant. When the various categories were tested against each other, it was found that the three groups who attended five or fewer programs were essentially the same. However, those who attended over five programs differed significantly from those attending fewer programs. The difference occurred between those below the median and those at or above the median salary for their age. Therefore, among those respondents whose companies placed an average emphasis on continuing education programs, those who participated in over five programs tended to have a lower percentage below the median salary for their age.

Of the 21.5% whose company placed high overall emphasis on continuing education programs, the majority had been involved in more than two programs in the given time span. Those participating in under two programs tended to be below the median salary for age, while the higher participants tended to be at or above the median. The percentages are given in Table 9. However, statistical analysis using the chi square procedure could not be done since more than 20% of the expected cell frequencies are less than five.

TABLE 8

The relationship between overall participation in continuing education programs and salary with respect to age among those respondents whose companies placed an overall average emphasis on continuing education programs. ($N_2 = 132$)

Number of Continuing Education Programs Attended Within the Past Two Years	Salary With Respect to Age			
	% above the median	% at the median	% below the median	Total %
Over 5 (n=51)	33.3	64.7	2.0	100
3 to 5 (n=57)	19.3	57.9	22.8	100
2 (n=14)	0	50.0	50.0	100
1 (n=10)	0	80.0	20.0	100

($X^2 = 20.42$ with 6 df; significant at .001)

TABLE 9

The relationship between overall participation in continuing education programs and salary with respect to age among those respondents whose companies placed an overall high emphasis on continuing education programs. ($N_3 = 53$)

Number of Continuing Education Programs Attended Within the Past Two Years	Salary With Respect to Age			
	% above the median	% at the median	% below the median	Total %
Over 5 (n=33)	24.3	72.7	3.0	100
3 to 5 (n=15)	26.7	66.7	6.7	100.1
2 (n=2)	0	0	100.0	100
1 (n=3)	0	33.3	66.7	100

(X^2 not calculated)

Among the respondents who reported that their past participation in continuing education programs had been of average or high value in their career advancement, participation was related to salary with respect to age. The data concerning a respondent's overall value on past participation in continuing education were secured through questions on the value of in-house programs, university noncredit programs, professional society or government programs, and credit course work. A rating scale of one (low value) to five (high value) was used for each question. The average of the numerical values became the data for overall value, in terms of career advancement, of past participation in continuing education programs. An average of two and one-half or below indicated a respondent placed an overall low value on past participation. Respondents who placed an overall average value on past participation were those whose numerical mean was greater than two and one-half and less than three and one-half. An average of three and one-half or above indicated a respondent placed an overall high value on past participation in continuing education programs.

Table 10 indicates the significant relationship between overall past participation and salary with respect to age for the 47.01% of the respondents who placed an overall average value, in terms of career advancement, on past participation in continuing education programs. In determining where the difference occurred, the categories were compared to each other using the chi square procedure. Those who had participated in one program were essentially the same as those who had participated in two programs. However, those who participated in three to five programs differed significantly from the others. Those who participated in over five programs differed significantly from the other groups also. In both cases, the significant break was between those below the median and those at or above the median salary with respect to age. Therefore, among the respondents who placed an average value, in terms of career advancement, on past participation in continuing education programs, those who participated in more than two programs had less tendency to be below the median salary for their age.

For the 20.09% who placed a high value on past participation, no statistical comparison was attempted. Only one respondent had not participated in more than two programs; that respondent was at the median salary for his age. The placement, with respect to median salary per age, of those attending more than two programs, is given in Table 11.

TABLE 10

The relationship between overall participation in continuing education programs and salary with respect to age among those respondents who placed an average value, in terms of career advancement, on past participation in continuing education programs. ($N_4 = 110$)

Number of Continuing Education Programs Attended Within the Past Two Years	Salary With Respect to Age			
	% above the median	% at the median	% below the median	Total %
Over 5 (n=60)	40.0	60.0	0	100
3 to 5 (n=35)	22.8	68.6	8.6	100
2 (n=8)	12.5	25.0	62.5	100
1 (n=7)	0	71.4	28.6	100

($X^2 = 30.25$ with 6 df; significant beyond .001)

TABLE 11

The relationship between overall participation in continuing education programs and salary with respect to age among those respondents who placed a high value, in terms of career advancement, on past participation in continuing education programs. ($N_5 = 47$)

Number of Continuing Education Programs Attended Within the Past Two Years	Salary With Respect to Age			
	% above the median	% at the median	% below the median	Total %
Over 2	28.3	65.2	6.5	100

A low value was placed by 32.9% of the respondents on past participation in continuing education programs in terms of their career advancement. Among these respondents, participation in continuing education programs was not related to the salary for their age. When the participation of respondents who placed an average value on past participation was considered, attendance at three or more programs implied less tendency to be below the median salary for their age. However, among the respondents who placed a low

value on past participation, their attendance at three, four, five, or more programs did not imply a tendency to be at, above, or below the median salary for age.

Dependent Variable Five: Salary With Respect to Job Responsibilities

There was a significant relationship between overall participation in continuing education programs and salary with respect to job responsibilities. Each respondent's technical and supervisory responsibilities and his salary were compared to the national median salary for engineers at his responsibility level. A respondent was then classed as being below, at, or above the median salary for his job responsibilities. Eighteen and five-tenths percent were below the median; 52.0% were at the median; 29.5% were above the median.

As seen in Table 12, as participation in continuing education programs increased, a higher percentage tended to be above the median salary for their job responsibilities. When the categories were compared, it was determined that the three groups who participated in five or less programs were essentially the same. The respondents who participated in over five programs differed significantly from the others. This difference occurred between those below the median and those at or above the median salary for their job responsibilities.

TABLE 12

The relationship between overall participation in continuing education programs and salary with respect to job responsibilities among all respondents. (N=246)

Number of Continuing Education Programs Attended Within the Past Two Years	Salary With Respect to Job Responsibilities			
	% above the median	% at the median	% below the median	Total %
Over 5 (n=108)	41.7	51.8	6.5	100
3 to 5 (n=96)	25.0	50.0	25.0	100
2 (n=25)	16.0	56.0	28.0	100
1 (n=17)	5.9	41.2	52.9	100

(X^2=28.01 with 6 df; significant beyond .001)

The above relationship was independent of the overall emphasis a respondent's company placed on continuing education. When considering the 25.1% who reported that their company placed an overall low emphasis on continuing education programs, those who participated in over five programs had a higher percentage above the median salary for their job responsibilities. Table 13 indicates that those who participated in over five programs also had a smaller percentage below the median salary for their job responsibilities. Since more than 20% of the expected cell frequencies in Table 13 are below five, no statistical analysis was possible.

TABLE 13

The relationship between overall participation in continuing education programs and salary with respect to job responsibilities among those respondents whose companies placed a low emphasis on continuing education programs. ($N_1 = 62$)

Number of Continuing Education Programs Attended Within the Past Two Years	Salary With Respect to Job Responsibilities			
	% above the median	% at the median	% below the median	Total %
Over 5 (n=25)	36.0	56.0	8.0	100
3 to 5 (n=24)	29.2	41.7	29.2	100.1
2 and 1 (n=13)	15.4	53.9	30.7	100

(X^2 not calculated)

Of the 53.4% who reported that their company placed an overall average emphasis on continuing education programs, those who attended more programs had a greater tendency to be above the median salary for their job responsibilities. The relationship shown in Table 14 is statistically significant. When Table 14 was informally broken down, those respondents who participated in over five programs had a significantly lower percentage below the median than the other respondents. The three groups who attended five or fewer programs were essentially the same.

TABLE 14

The relationship between overall participation in continuing education programs and salary with respect to job responsibilities among those respondents whose companies placed an average emphasis on continuing education programs. ($N_2 = 132$)

Number of Continuing Education Programs Attended Within the Past Two Years	Salary With Respect to Job Responsibilities			
	% above the median	% at the median	% below the median	Total %
Over 5 (n=51)	39.2	54.9	5.9	100
3 to 5 (n=57)	21.1	52.6	26.3	100
2 (n=14)	14.3	64.3	21.4	100
1 (n=10)	0	40.0	60.0	100

($X^2 = 16.82$ with 6 df; significant at .01)

Of the 21.5% whose company placed high overall emphasis on continuing education programs, the majority had been involved in more than two programs in the given time span. Those participating in under two programs tended to be below the median, while the higher participants tended to be at or above the median. Since the smallest expected cell frequency is less than one, no statistical analysis was attempted. However, the percentages are given in Table 15.

Among the respondents who reported that their overall past participation in continuing education programs had been of average or high value in their career advancement, participation was related to salary with respect to job responsibilities. Of the 47.0% who placed an average value on past participation, those who participated in over five continuing education programs had a significantly lower percentage below the median salary for their job responsibilities than the other respondents. There were no significant differences among the groups attending five or fewer programs. The relationship is shown in Table 16.

TABLE 15

The relationship between overall participation in continuing education programs and salary with respect to job responsibilities among those respondents whose companies placed a high emphasis on continuing education programs. ($N_3 = 52$)

Number of Continuing Education Programs Attended Within the Past Two Years	Salary With Respect to Job Responsibilities			
	% above the median	% at the median	% below the median	Total %
Over 5 (n=32)	50.0	43.8	6.2	100
3 to 5 (n=15)	33.3	53.3	13.4	100
2 and 1 (n=15)	20.0	20.0	60.0	100

(X^2 not calculated)

TABLE 16

The relationship between overall participation in continuing education programs and salary with respect to job responsibilities among those respondents who placed an average value, in terms of career advancement, on past participation in continuing education programs. ($N_4 = 109$)

Number of Continuing Education Programs Attended Within the Past Two Years	Salary With Respect to Job Responsibilities			
	% above the median	% at the median	% below the median	Total %
Over 5 (n=59)	47.5	49.1	3.4	100
3 to 5 (n=35)	28.6	45.7	25.7	100
2 (n=8)	25.0	50.0	25.0	100
1 (n=7)	0	28.6	71.4	100

($X^2 = 20.31$ with 6 df; significant at .002)

For the 20.1% who placed a high value on past participation, no statistical comparison was attempted. Only one respondent had not participated in more than two programs; that respondent was below the median salary for his job responsibilities. The placement, with respect to median salary per job responsibilities, of those attending more than two programs, is given in Table 17.

TABLE 17

The relationship between overall participation in continuing education programs and salary with respect to job responsibilities among those respondents who placed a high value, in terms of career advancement, on past participation in continuing education programs. ($N_5 = 47$)

Number of Continuing Education Programs Attended Within the Past Two Years	Salary With Respect to Job Responsibilities			
	% above the median	% at the median	% below the median	Total %
More than 2	44.6	48.9	6.5	100

Thirty-two and nine-tenths percent of the respondents placed a low value, in terms of their career advancement, on past participation in continuing education programs. Participation by these respondents, in contrast to those who placed an average or high value on past participation, was not related to salary with respect to job responsibilities. Among this 32.9%, those who attended more programs had approximately the same placement around the median as those attending fewer programs.

Dependent Variable Six: Salary With Respect to Age and Job Responsibilities

There was a significant relationship between overall participation and salary with respect to age and job responsibilities. Each respondent's standing, in relation to the median, was examined for the two previous variables, salary per age and salary per job responsibilities. In determining the positions in the category, salary for age and job responsibilities, the following criteria were used:

1. **To be above the median,** a respondent had to be above the median in both previous variables, or a combination of above the median and at the median.
2. **To be at the median,** a respondent had to be at the median in both previous variables, or a combination of above the median and below the median.

3. **To be below the median,** a respondent had to be below the median in both previous variables, or a combination of below the median and at the median.

In salary with respect to age and job responsibilities, 28.0% of the respondents were below the median, 33.5% were at the median, and 38.5% were above the median.

Table 18 indicates that as respondents' participation in continuing education programs increased, a higher percentage tended to be above the median salary for their age and job responsibilities. The relationship was statistically significant. When the categories were compared via chi square with fewer df, the following differences were determined. Compared to the other respondents, those who participated in over five programs:

1. Had a significantly higher percentage above the median salary for their age and job responsibilities.
2. Had a significantly lower percentage below the median salary per age and job responsibilities.

The groups attending five or fewer programs were essentially the same.

TABLE 18

The relationship between overall participation in continuing education programs and salary with respect to age and job responsibilities among all respondents. (N=246)

Number of Continuing Education Programs Attended Within the Past Two Years	Salary With Respect to Age and Job Responsibilities			
	% above the median	% at the median	% below the median	Total %
Over 5 (n=108)	59.3	32.4	8.3	100
3 to 5 (n=96)	31.3	30.2	38.5	100
2 (n=25)	8.0	44.0	48.0	100
1 (n=17)	0	35.3	64.7	100

($X^2=36.03$ with 6 df; significant beyond .001)

The above relationship was independent of the overall emphasis a respondent's company placed on continuing education. When considering the 25.1% who reported their company placed an overall low emphasis on continuing education programs, those who participated in more programs had a higher percentage above the median salary per age and job responsibilities. The lowest percentage below the median salary occurred in the group involved in over five programs. The percentages are given in Table 19. No statistical analysis was attempted since the criterion for the chi square procedure was not met.

TABLE 19

The relationship between overall participation in continuing education programs and salary with respect to age and job responsibilities among those respondents whose companies placed an overall low emphasis on continuing education programs. ($N_1 = 62$)

Number of Continuing Education Programs Attended Within the Past Two Years	Salary With Respect to Age and Job Responsibilities			
	% above the median	% at the median	% below the median	Total %
Over 5 (n=25)	56.0	28.0	16.0	100
3 to 5 (n=24)	20.8	29.2	50.0	100
2 and 1 (n=13)	15.4	46.2	38.4	100

(X^2 not calculated)

Of the 53.4% who reported their company placed an overall average emphasis on continuing education programs, none of those who participated in under three programs were above the median salary for their age and job responsibilities. The relationship as shown in Table 20 was statistically significant. When the relationship was informally broken down, two significant differences were found. Compared to the other respondents, those respondents who had participated in over five programs:

1. Had a significantly higher percentage above the median salary for their age and job responsibilities.
2. Had a significantly lower percentage below the median salary for the age and job responsibilities.

The groups attending five or fewer programs were essentially the same.

TABLE 20

The relationship between overall participation in continuing education programs and salary with respect to age and job responsibilities among those respondents whose companies placed an overall average emphasis on continuing education programs. ($N_2 = 132$)

Number of Continuing Education Programs Attended Within the Past Two Years	Salary With Respect to Age and Job Responsibilities			
	% above the median	% at the median	% below the median	Total %
Over 5 (n=51)	58.8	35.3	5.9	100
3 to 5 (n=57)	29.9	29.8	40.3	100
2 (n=14)	0	50.0	50.0	100
1 (n=10)	0	30.0	70.0	100

($X^2 = 22.61$ with 6 df; significant beyond .001)

Of the 21.5% whose company placed high overall emphasis on continuing education programs, the majority have been involved in more than two programs in the given time span. Those participating in one or two programs tended to be below the median, while those attending three or over tended to be at or above the median. The percentages are given in Table 21. No statistical analysis was attempted since the criterion for the chi square procedure was not met.

Among the respondents who reported that their overall past participation in continuing education programs had been of average or high value in their career advancement, participation was related to salary with respect to age and job responsibilities. Of the 47.0% who placed an average value on past participation, those who participated in more continuing education programs tended to have a higher percentage above the median. Table 22 gives the significant relationship. Using the chi square procedure with fewer df, the following significant differences were found. Compared to the other respondents,

TABLE 21

The relationship between overall participation in continuing education programs and salary with respect to age and job responsibilities among those respondents whose companies placed an overall high emphasis on continuing education programs. ($N_3 = 52$)

Number of Continuing Education Programs Attended Within the Past Two Years	Salary With Respect to Age and Job Responsibilities			
	% above the median	% at the median	% below the median	Total %
Over 5 (n=32)	62.6	31.2	6.2	100
3 to 5 (n=15)	53.4	33.3	13.3	100
2 and 1 (n=5)	0	20.0	80.0	100

(X^2 not calculated)

those respondents who participated in over five programs:

1. Had a significantly higher percentage above the median salary for their age and job responsibilities.
2. Had a significantly lower percentage below the median salary for their age and job responsibilities.

The groups attending five or fewer programs were essentially the same.

For the 20.1% who placed a high value on past participation, no statistical comparison was attempted. Only one respondent had not participated in more than two programs; that respondent was below the median salary for his age and job responsibilities. The placement, with respect to median salary per age and job responsibilities, is given in Table 23.

Thirty-two and nine-tenths percent of the respondents placed a low value on past participation in continuing education programs in terms of their career advancement. As with previous variables, the amount of participation by these respondents has no relationship to their being above, at, or below the median salary with respect to age and job responsibilities.

OG 57

TABLE 22

The relationship between overall participation in continuing education programs and salary with respect to age and job responsibilities among those respondents who placed an average value, in terms of career advancement, on past participation in continuing education programs. ($N_4 = 109$)

Number of Continuing Education Programs Attended Within the Past Two Years	Salary With Respect to Age and Job Responsibilities			
	% above the median	% at the median	% below the median	Total %
Over 5 (n=59)	71.2	25.4	3.4	100
3 to 5 (n=35)	42.8	28.6	28.6	100
2 (n=8)	12.5	37.5	50.0	100
1 (n=7)	0	28.6	71.4	100

($X^2 = 21.32$ with 6 df; significant at .002)

TABLE 23

The relationship between overall participation in continuing education programs and salary with respect to age and job responsibilities among those respondents who placed a high value, in terms of career advancement, on past participation in continuing education programs. ($N_5 = 47$)

Number of Continuing Education Programs Attended Within the Past Two Years	Salary With Respect to Age and Job Responsibilities			
	% above the median	% at the median	% below the median	Total %
Over 2	56.5	34.8	8.7	100

Dependent Variable Three: Salary Increases and Promotions

When overall participation in continuing education was compared to the number of salary increases and promotions a respondent had received in the past two years, a significant relationship occurred. Each respondent was asked to state the number of salary increases and promotions he had received during the past two years. Fifteen and five-tenths percent had received zero or one, 49.8% received two, and 34.7% received more than two. Two was considered to be the average number of salary increases and promotions received in the past two years.

Table 24 illustrates the significant relationship between participation in continuing education programs and the number of salary increases and promotions received. The majority of those who participated in five or under programs were at or below the average number (two) of salary increases and promotions. Compared to the other respondents, those who participated in over five programs had a significantly higher percentage above the average number of salary increases and promotions.

TABLE 24

The relationship between overall participation in continuing education programs and salary increases and promotions among all respondents. (N=245)

Number of Continuing Education Programs Attended Within the Past Two Years	Number of Salary Increases and Promotions Received Within the Past Two Years				
	4 and above	3	2 (average)	0, 1	Total
Over 5 (n=108)	13.0%	38.0%	40.7%	8.3%	100%
3 to 5 (n=95)	7.4%	16.9%	52.6%	23.1%	100%
2 (n=26)	7.7%	11.5%	57.7%	23.1%	100%
1 (n=16)	0%	6.2%	81.3%	12.5%	100%

(X^2=25.02 with 9 df; significant at .003)

This relationship was independent of the overall emphasis a respondent's company placed on continuing education. When considering the 62 respondents whose companies placed low emphasis on continuing education programs, those attending over five programs had a higher percentage who received over two salary increases and promotions. The percentages are given in Table 25. However, statistical analysis using the chi square procedure could not be done since more than 20% of the expected cell frequencies are less than five.

TABLE 25

The relationship between overall participation in continuing education programs and salary increases and promotions among those respondents whose companies placed an overall low emphasis on continuing education programs. ($N_1 = 62$)

Number of Continuing Education Programs Attended Within the Past Two Years	Number of Salary Increases and Promotions Received Within the Past Two Years			
	3 and above	2 (average)	0, 1	Total
Over 5 (n=25)	44.0%	40.0%	16.0%	100%
3 to 5 (n=24)	20.8%	54.2%	25.0%	100%
2 and 1 (n=13)	23.1%	54.1%	22.8%	100%

(X^2 not calculated)

Of the 53.4% who reported their company placed an overall average emphasis on continuing education programs, those attending over five programs tended to have received more than the average number of salary increases and promotions. The relationship as shown in Table 26 is statistically significant. When the various categories were tested against each other, it was found that those who attended over five programs had significantly fewer below the average number (two) of salary increases and promotions during the past two years.

Of the 21.5% whose company placed high overall emphasis on continuing education programs, the majority had been involved in more than two programs in the given time span. None of those who attended less than three programs had received more than the average number

of salary increases and promotions. The percentages are given in Table 27. However, statistical analysis using the chi square procedure could not be done since more than 20% of the expected cell frequencies are less than five.

TABLE 26

The relationship between overall participation in continuing education programs and salary increases and promotions among those respondents whose companies placed an overall average emphasis on continuing education programs. ($N_2 = 132$)

Number of Continuing Education Programs Attended Within the Past Two Years	Number of Salary Increases and Promotions Received Within the Past Two Years			
	3 and above	2 (average)	0, 1	Total
Over 5 (n=51)	49.0%	47.1%	3.9%	100%
3 to 5 (n=57)	22.8%	54.4%	22.8%	100%
2 and 1 (n=24)	8.3%	70.8%	20.9%	100%

($X^2 = 19.43$ with 4 df; significant beyond .001)

TABLE 27

The relationship between overall participation in continuing education programs and salary increases and promotions among those respondents whose companies placed an overall high emphasis on continuing education programs. ($N_3 = 51$)

Number of Continuing Education Programs Attended Within the Past Two Years	Number of Salary Increases and Promotions Received Within the Past Two Years			
	3 and above	2 (average)	0, 1	Total
Over 5 (n=32)	59.4%	31.2%	9.4%	100%
3 to 5 (n=14)	35.7%	42.9%	21.4%	100%
2 and 1 (n=5)	0%	80.0%	20.0%	100%

(X^2 not calculated)

Among the respondents who reported that their past participation in continuing education programs had been of average or high value in their career advancement, participation appeared to be related to the number of salary increases and promotions received. For the 47.0% of the respondents who placed an average value, in terms of career advancement, on past participation in continuing education programs, too few had received zero or one salary increase or promotion for the relationship to be statistically analyzed. However, Table 28 indicates that as participation in continuing education programs increased, so does the tendency to have received more than two salary increases and promotions.

TABLE 28

The relationship between overall participation in continuing education programs and salary increases and promotions among those respondents who placed an average value, in terms of career advancement, on past participation in continuing education programs. ($N_4 = 109$)

Number of Continuing Education Programs Attended Within the Past Two Years	Number of Salary Increases and Promotions Received Within the Past Two Years			
	3 and above	2 (average)	0, 1	Total
Over 5 (n=59)	54.3%	39.0%	6.7%	100%
3 to 5 (n=35)	31.4%	57.2%	11.4%	100%
2 and 1 (n=15)	6.7%	86.7%	6.7%	100.1%

(X^2 not calculated)

For the 20.1% who placed a high value on past participation, no statistical comparison was attempted. Only one respondent had not participated in more than two programs; that respondent had received the average number of salary increases and promotions. The placement, with respect to the average number, of those attending more than two programs, is given in Table 29.

Thirty-two and nine-tenths percent of the respondents placed a low value on past participation in continuing education programs in terms of their career advancement. As with previous variables, the

TABLE 29

The relationship between overall participation in continuing education programs and salary increases and promotions among those respondents who placed a high value, in terms of career advancement, on past participation in continuing education programs. ($N_S = 47$)

Number of Continuing Education Programs Attended Within the Past Two Years	Number of Salary Increases and Promotions Received Within the Past Two Years			
	3 and above	2 (average)	0, 1	Total
Over 2	56.5%	28.3%	15.2%	100%

amount of participation by these respondents had no relationship to the number of salary increases and promotions received.

Dependent Variable Two: Job Satisfaction

There was a significant relationship between overall participation in continuing education programs and job satisfaction, as shown in Table 30. Each respondent was asked his degree of satisfaction on a rating scale of five (highly satisfied) to one (not satisfied), in terms of his present job situation. Eleven and eight-tenths percent marked one or two which indicated "not satisfied"; 32.7% marked three, "satisfied"; 55.5% marked four or five, "highly satisfied." When the categories within Table 30 were compared, it was found that among those who attended over five programs, a significantly higher percentage indicated that they were "highly satisfied" with their present job situation.

TABLE 30

The relationship between overall participation in continuing education programs and job satisfaction among all respondents. ($N = 254$)

Number of Continuing Education Programs Attended Within the Past Two Years	Degree of Satisfaction With Present Job Situation			
	Highly satisfied	Satisfied	Not satisfied	Total
Over 5 (n=110)	67.3%	24.5%	8.2%	100%
3 to 5 (n=99)	46.5%	39.4%	14.1%	100%
2 and 1 (n=45)	46.7%	37.7%	15.6%	100%

($X^2 = 11.0$ with 4 df; significant at .03)

Because of the low percentage (11.8%) who indicated they were less than satisfied with their present job situation, the above relationship was not tested under the control either of company emphasis on continuing education programs or of value placed in terms of career advancement on past participation in continuing education programs.

There was no relationship between overall past participation in continuing education programs and the number of years a respondent had been employed by his present company.

Although overall participation in continuing education programs was related to five of the dependent variables, it was believed necessary to determine if any one form of participation was more highly related than another. The respondents were asked the number of programs they had participated in during the past two years in the following areas:

1. Credit courses, excluding work toward an undergraduate degree.
2. In-house educational (training) courses, seminars, or conferences.
3. Conferences, institutes, short courses conducted by a university or university extension.
4. Seminars, institutes, short courses conducted by a professional society or the government.
5. Correspondence courses.

Participation in credit courses and correspondence courses was extremely low, 17.9% and 6.6%, respectively. Therefore, no attempt was made to relate these to the dependent variables. The other three independent variables had almost the same relationships with the dependent variables as did overall participation.

INDEPENDENT VARIABLE THREE: IN-HOUSE PROGRAMS

Seventy-three and five-tenths percent of the respondents had participated in some type of in-house continuing education program during the past two years. Their participation broke down into the following categories: one program—19.4%; two programs—19.7%; over two programs—34.4%. Participation in in-house programs was related to three of the dependent variables: salary with respect to age; salary with respect to job responsibilities; salary with respect to age and job responsibilities.

Dependent Variable Four: Salary With Respect to Age

Table 31 indicates the significant relationship between participation in in-house programs and salary with respect to age. The relationship was broken down using chi square with fewer df. Com-

pared to the other respondents, those who had participated in three or more in-house programs had a significantly lower percentage below the median salary for their age.

TABLE 31

The relationship between participation in in-house programs and salary with respect to age among all respondents. (N=255)

Number of In-house Programs Attended Within the Past Two Years	Salary With Respect to Age			
	% above the median	% at the median	% below the median	Total %
3 and over (n=87)	26.4	64.4	9.2	100
2 (n=51)	24.0	54.0	22.0	100
1 (n=49)	12.2	59.2	28.6	100
0 (n=68)	17.9	68.7	13.4	100

($X^2=13.05$ with 6 df; significant at .04)

Dependent Variable Five: Salary With Respect to Job Responsibilities

There was a significant relationship between participation in in-house programs and salary with respect to job responsibilities. This is shown in Table 32. When the various categories were compared, it was found that those attending one or zero programs differed significantly from the other two groups. Compared to those attending two or more in-house programs, those who had participated in none or one had a significantly higher percentage below the median salary for their age.

Dependent Variable Six: Salary With Respect to Age and Job Responsibilities

Although participation in in-house programs had a significant relationship (Table 33) with salary for age and job responsibilities, the difference between the categories differed from the previous two relationships. It appears, in this instance, that those respondents attending only one in-house program in the past two years had a

TABLE 32

The relationship between participation in in-house programs and salary with respect to job responsibilities among all respondents. (N=254)

Number of In-house Programs Attended Within the Past Two Years	Salary With Respect to Job Responsibilities			
	% above the median	% at the median	% below the median	Total %
3 and over (n=86)	34.9	50.0	15.1	100
2 (n=51)	32.0	58.0	10.0	100
1 (n=49)	12.2	59.2	28.6	100
0 (n=68)	34.3	43.3	22.4	100

(X^2=13.87 with 6 df; significant at .03)

TABLE 33

The relationship between participation in in-house programs and salary with respect to age and job responsibilities among all respondents. (N=254)

Number of In-house Programs Attended Within the Past Two Years	Salary With Respect to Age and Job Responsibilities			
	% above the median	% at the median	% below the median	Total %
3 and over (n=86)	53.5	27.9	18.6	100
2 (n=51)	39.2	33.3	27.5	100
1 (n=49)	18.3	36.7	45.0	100
0 (n=68)	33.8	38.2	28.0	100

(X^2=19.69 with 6 df; significant at .006)

significantly lower percentage above the median salary for their age and job responsibilities. This same tendency appeared with the two previous dependent variables, but the difference was not significant. In the case of in-house programs, respondents from companies who do not offer in-house programming seem to be better off than respondents who participate only once when other programs are offered.

Participation in in-house programs had no relationship with the following three dependent variables:

1. Years employed by company.
2. Job satisfaction.
3. Number of salary increases and promotions.

INDEPENDENT VARIABLE FOUR: UNIVERSITY NONCREDIT PROGRAMS

As stated previously, all respondents were participants in a university extension program at the time of the survey. However, the majority, 52.1%, were participating in their first university noncredit program in the past two years. Twenty-four and one-tenth were participating in their second university noncredit program, while 23.8% had participated in over two programs. Participation in university programs was related to the four following dependent variables.

TABLE 34

The relationship between participation in university noncredit programs and salary with respect to age among all respondents. (N=255)

Number of University or University Extension Noncredit Programs Attended Within the Past Two Years	Salary With Respect to Age			
	% above the median	% at the median	% below the median	Total %
3 and over (n=61)	29.5	68.9	1.6	100
2 (n=62)	24.2	64.5	11.3	100
1 (n=132)	15.1	59.1	25.8	100

(X^2=21.75 with 4 df; significant beyond .001)

Dependent Variable Three: Salary With Respect to Age

Table 34 indicates the significant relationship between participation in university programs and salary for age. When the relationship was broken down, it was found that those respondents who participated in two programs were essentially the same as those participating in more than two programs. Those respondents who had attended at least two university programs during the past two years had a significantly lower percentage below the median salary for their age than those attending their first university program.

Dependent Variable Five: Salary With Respect to Job Responsibilities

As participation in university programs increases, a higher percentage tended to be above the median salary for their job responsibilities. The relationship as shown in Table 35 is significant. When the various categories were compared, it was found that the respondents who had participated in two or more programs in the past two years had a significantly lower percentage below the median salary for their job responsibilities than those respondents attending their first university program.

TABLE 35

The relationship between participation in university noncredit programs and salary with respect to job responsibilities among all respondents. (N=254)

Number of University or University Extension Noncredit Programs Attended Within the Past Two Years	Salary With Respect to Job Responsibilities			
	% above the median	% at the median	% below the median	Total %
3 and over (n=60)	41.7	48.3	10.0	100
2 (n=62)	33.9	54.8	11.3	100
1 (n=132)	21.9	52.3	25.8	100

(X^2=14.14 with 4 df; significant beyond .001)

Dependent Variable Six: Salary With Respect to Age and Job Responsibilities

There was a significant relationship between the number of university noncredit programs in which a respondent had participated and the salary for age and job responsibilities. Compared to those attending their first university program, the respondents who had participated in two or more programs:

1. Had a significantly higher percentage above the median salary for their age and job responsibilities.
2. Had a significantly lower percentage below the median salary for their age and job responsibilities.

The relationship is given in Table 36.

TABLE 36

The relationship between participation in university noncredit programs and salary with respect to age and job responsibilities among all respondents. (N=254)

Number of University or University Extension Noncredit Programs Attended Within the Past Two Years	Salary With Respect to Age and Job Responsibilities			
	% above the median	% at the median	% below the median	Total %
3 and over (n=60)	56.7	31.7	11.6	100
2 (n=62)	48.4	33.9	17.7	100
1 (n=132)	25.7	34.1	40.2	100

(X^2=27.37 with 4 df; significant beyond .001)

Dependent Variable Three: Salary Increases and Promotions

The majority of those participating in three or more university programs during the past two years received more than the average number (two) of salary increases and promotions in the preceding two years. Table 37 indicates the significant relationship. When the categories were compared, it was found that a significantly higher percentage of those participating in two or more programs had received above the average number of salary increases and promo-

tions. No difference occurred between the groups participating in two or in over two university noncredit programs.

TABLE 37

The relationship between participation in university noncredit programs and salary increases and promotions among all respondents. (N=253)

Number of University or University Extension Noncredit Programs Attended Within the Past Two Years	Number of Salary Increases and Promotions Received During the Past Two Years				
	4 and above	3	2 (average)	0, 1	Total
3 and over (n=59)	11.9%	39.0%	40.7%	8.4%	100%
2 (n=62)	16.2%	24.2%	41.9%	17.7%	100%
1 (n=132)	5.3%	17.4%	59.1%	18.2%	100%

(X^2=20.01 with 6 df; significant at .002)

Participation in university noncredit programs had no relationship with the following two dependent variables:

1. Years employed by company.
2. Job satisfaction.

INDEPENDENT VARIABLE FIVE: PROFESSIONAL SOCIETY AND GOVERNMENT PROGRAMS

Of the 257 respondents, 44.7% had not attended a professional society or government-sponsored continuing education program in the past two years; however, 19.5% had participated in one program, 18.3% in two programs, and 17.5% in three or more programs. Participation in these programs had a relationship with five of the dependent variables.

Dependent Variable Four: Salary With Respect to Age

The significant relationship between participation in professional society or government-sponsored programs and salary with respect to age is given in Table 38. When the relationship was broken down, the following significant difference occurred: Compared to those at-

tending programs, the respondents who had not participated in a professional society or government program had a significantly higher percentage below the median salary for their age.

TABLE 38

The relationship between participation in professional society or government programs and salary with respect to age among all respondents. (N=255)

Number of Professional Society or Government Programs Attended Within the Past Two Years	Salary With Respect to Age			
	% above the median	% at the median	% below the median	Total %
3 and over (n=45)	24.4	71.1	4.4	99.9
2 (n=46)	32.6	65.2	2.2	100
1 (n=50)	24.0	64.0	12.0	100
0 (n=114)	13.1	57.9	29.0	100

($X^2=28.85$ with 6 df; significant beyond .001)

Dependent Variable Five: Salary With Respect to Job Responsibilities

The respondents who had participated in a professional society or government program differed significantly, in terms of this dependent variable, from those not attending. The relationship is given in Table 39. Compared with the nonparticipants, those participating in programs had a significantly lower percentage below the median salary for their job responsibilities. Those participating in two or more programs had a higher percentage above the median than those attending no program or only one program.

Dependent Variable Six: Salary With Respect to Age and Job Responsibilities

There was a significant relationship between participation in professional society or government programs and salary with respect to age and job responsibilities as given in Table 40. When this relationship was broken down, the respondents who had attended two or more programs had significantly fewer below the median salary for their age and job responsibilities when compared with the other respondents.

TABLE 39

The relationship between participation in professional society or government programs and salary with respect to job responsibilities among all respondents. (N=254)

Number of Professional Society or Government Programs Attended Within the Past Two Years	Salary With Respect to Job Responsibilities			
	% above the median	% at the median	% below the median	Total %
3 and over (n=45)	46.7	44.4	8.9	100
2 (n=45)	42.2	55.6	2.2	100
1 (n=50)	24.0	66.0	10.0	100
0 (n=114)	20.2	47.4	32.4	100

(X^2=36.43 with 6 df; significant beyond .001)

TABLE 40

The relationship between participation in professional society or government programs and salary with respect to age and job responsibilities among all respondents. (N=254)

Number of Professional Society or Government Programs Attended Within the Past Two Years	Salary With Respect to Age and Job Responsibilities			
	% above the median	% at the median	% below the median	Total %
3 and over (n=45)	55.6	33.3	11.1	100
2 (n=45)	62.2	33.3	4.4	99.9
1 (n=50)	38.0	42.0	20.0	100
0 (n=114)	22.8	29.8	47.4	100

(X^2=48.74 with 6 df; significant beyond .001)

Dependent Variable Three: Salary Increases and Promotions

Those respondents who participated in two or more professional society or government programs had a significantly higher percentage who received more than the average number (two) of salary increases and promotions during the past two years. The significant relationship is indicated in Table 41.

TABLE 41

The relationship between participation in professional society or government programs and salary increases and promotions among all respondents. (N=253)

Number of Professional Society or Government Programs Attended Within the Past Two Years	Number of Salary Increases and Promotions Received During the Past Two Years				
	4 and above	3	2 (average)	0, 1	Total
3 and over (n=45)	15.6%	28.9%	42.2%	13.3%	100%
2 (n=45)	8.9%	42.2%	37.8%	11.1%	100%
1 (n=49)	16.3%	18.4%	51.0%	14.3%	100%
0 (n=114)	4.4%	17.5%	58.8%	19.3%	100%

($X^2=18.32$ with 9 df; significant at .03)

Dependent Variable Two: Job Satisfaction

There was a significant relationship between participation in professional society or government programs and job satisfaction as shown in Table 42. When the relationship was broken down, the following significant difference occurred: Compared to those who had attended two or more programs, those respondents participating in zero or one program had a significantly higher percentage who stated they were "not satisfied" with their present job situation.

Participation in professional society or government programs was not related to the number of years a respondent had been employed by his company.

TABLE 42

The relationship between participation in professional society or government programs and job satisfaction among all respondents. (N=255)

Number of Professional Society or Government Programs Attended Within the Past Two Years	Degree of Satisfaction With Present Job Situation				
	Highly satisfied		Satisfied	Not satisfied	Total
3 and over (n=45)	33.3%	35.6%	26.7%	4.4%	100%
2 (n=46)	38.6%	25.0%	31.8%	4.6%	100%
1 (n=49)	16.3%	38.8%	32.7%	12.2%	100%
0 (n=115)	12.5%	34.8%	34.8%	17.9%	100%

($X^2=23.18$ with 9 df; significant at .006)

INDEPENDENT VARIABLE TWO: EMPHASIS PLACED ON ESTABLISHING PROFESSIONAL RELATIONSHIPS

The emphasis a respondent placed on establishing professional relationships was related to four of the dependent variables. The respondent was asked to indicate the degree of emphasis, on a rating scale of five (high emphasis) to one (low emphasis), he placed on establishing professional relationships with engineers in other companies for the informal exchange of information as problems arise. Of the 257 respondents, 36.5% placed a below average emphasis, 26.8% placed an average emphasis, and 36.6% placed an above average emphasis on establishing professional relationships.

Dependent Variable Four: Salary With Respect to Age

Table 43 gives the significant relationship which occurred between the emphasis an engineer placed on establishing professional relationships and his salary for his age. When the categories were compared, those respondents who placed an above average emphasis on establishing professional relationships differed significantly from those who placed an average or below emphasis. The respondents who placed an above average emphasis had a significantly lower percentage below the median salary for their age.

TABLE 43

The relationship between the emphasis placed on establishing professional relationships and salary with respect to age among all respondents. (N=255)

The Degree of Emphasis Placed on Establishing Professional Relationships With Engineers in Other Companies for the Informal Exchange of Information as Problems Arise	Salary With Respect to Age			
	% above the median	% at the median	% below the median	Total %
Above average (n=93)	25.8	67.8	6.4	100
Average (n=69)	14.5	68.1	17.4	100
Below average (n=93)	20.4	53.8	25.8	100

($X^2=14.96$ with 4 df; significant at .008)

Dependent Variable Six: Salary With Respect to Age and Job Responsibilities

There was a significant relationship between the emphasis placed on establishing professional relationships and salary for age and job responsibilities. Table 44 gives the relationship. When this relationship was broken down, the following differences occurred. Compared to other respondents, those placing an above average emphasis on establishing professional relationships:

1. Had a significantly higher percentage above the median salary for their age and job responsibilities.
2. Had a significantly lower percentage below the median salary for their age and job responsibilities.

Dependent Variable Three: Salary Increases and Promotions

Table 45 indicates the significant relationship between the emphasis an engineer placed on establishing professional relationships and the number of salary increases and promotions he had received in the past two years. When the various categories were compared, no significant differences were found. However, from the percentages

75

TABLE 44

The relationship between the emphasis placed on establishing professional relationships and salary with respect to age and job responsibilities among all respondents. (N=254)

The Degree of Emphasis Placed on Establishing Professional Relationships With Engineers in Other Companies for the Informal Exchange of Information as Problems Arise	Salary With Respect to Age and Job Responsibilities			
	% above the median	% at the median	% below the median	Total %
Above average (n=92)	51.1	32.6	16.3	100
Average (n=69)	34.8	34.8	30.4	100
Below average (n=93)	29.0	33.3	37.6	99.9

(X^2=13.98 with 4 df; significant at .009)

TABLE 45

The relationship between the emphasis placed on establishing professional relationships and salary increases and promotions among all respondents. (N=253)

The Degree of Emphasis Placed on Establishing Professional Relationships With Engineers in Other Companies for the Informal Exchange of Information as Problems Arise	Number of Salary Increases and Promotions Received During the Past Two Years			
	3 and above	2 (average)	0, 1	Total
Above average (n=92)	45.7%	43.5%	10.9%	100.1%
Average (n=68)	30.9%	48.5%	20.6%	100%
Below average (n=93)	23.7%	59.1%	17.2%	100%

(X^2=11.70 with 4 df; significant at .02)

given it appears that as respondents placed more emphasis on establishing professional relationships, a higher percentage tended to receive over the average number (two) of salary increases and promotions.

Dependent Variable Two: Job Satisfaction

The significant relationship between emphasis placed on establishing professional relationships and job satisfaction is given in Table 46. Compared to the other respondents, those who placed above average emphasis on establishing professional relationships had a significantly lower percentage who stated they were "not satisfied" with their present job situation. The group of respondents who placed average emphasis on establishing professional relationships were essentially the same as those placing a below average emphasis.

TABLE 46

The relationship between the emphasis placed on establishing professional relationships and job satisfaction among all respondents. (N=255)

The Degree of Emphasis Placed on Establishing Professional Relationships With Engineers in Other Companies for the Informal Exchange of Information as Problems Arise	Degree of Satisfaction With Present Job Situation			
	Highly satisfied	Satisfied	Not satisfied	Total
Above average (n=93)	67.0%	26.6%	6.4%	100%
Average (n=69)	56.7%	32.8%	10.5%	100%
Below average (n=93)	43.6%	38.3%	18.1%	100%

($X^2=12.22$ with 4 df; significant at .015)

There was no relationship between emphasis placed on establishing professional relationships and the following two dependent variables:

1. Salary with respect to job responsibilities.
2. Years employed by company.

One independent variable, emphasis placed on reading professional and technical literature, had no relationship with any of the dependent variables.

DEPENDENT VARIABLE TWO: JOB SATISFACTION

Cross-tabulations were run between the job satisfaction item and most items in the survey to determine the relationships, if any. In addition to the relationships involving job satisfaction described earlier in this chapter, ten additional relationships were found. All variables have been previously defined.

A significant relationship occurred between total company employment and job satisfaction (Table 47). Of those engineers with companies of less than 100 employees, the majority tended to state that they were "highly satisfied" in terms of their present job situation. Although almost half of the respondents were from companies of over 5,000 employees, they tended only to state that they were "satisfied" with their present job situation.

TABLE 47

The relationship between total company employment and job satisfaction. (N=255)

Number of People Employed in Company, Including All Divisions	Degree of Satisfaction With Present Job Situation				
	Highly satisfied	(Above average)	Satisfied	Not satisfied	Total
Over 5000 (n=106)	12.3%	34.9%	40.6%	12.3%	100.1%
1001-5000 (n=62)	19.4%	38.7%	30.7%	11.3%	100.1%
501-1000 (n=19)	10.5%	42.1%	36.8%	10.5%	99.9%
100-500 (n=30)	20.0%	33.3%	30.0%	16.7%	100%
Under 100 (n=38)	57.9%	21.0%	13.2%	7.9%	100%

($X^2=34.26$ with 12 df; significant at .0004)

There was a significant relationship between engineering staff size and job satisfaction (Table 48). Those engineers who were part of smaller staffs tended to be more satisfied with their job situation. Half of the "highly satisfied" engineers were members of staffs of under 10 engineers. In general, as engineering staff size decreased, job satisfaction increased.

78'

TABLE 48

The relationship between engineering staff size and job satisfaction. (N=251)

Approximate Number of Engineers Employed in Division	Degree of Satisfaction With Present Job Situation				
	Highly satisfied	(Above average)	Satisfied	Not satisfied	Total
Over 500 (n=11)	18.2%	9.1%	54.5%	18.2%	100%
101-500 (n=44)	9.1%	22.7%	54.6%	13.6%	100%
31-100 (n=56)	16.1%	42.9%	25.0%	16.1%	100.1%
11-30 (n=69)	17.4%	40.6%	34.8%	7.2%	100%
10 and under (n=71)	38.0%	29.6%	21.1%	11.3%	100%

(X^2=28.04 with 12 df; significant at .0055)

TABLE 49

The relationship between salary level and job satisfaction. (N=253)

Annual Salary	Degree of Satisfaction With Present Job Situation				
	Highly satisfied	(Above average)	Satisfied	Not satisfied	Total
$20,000 and above (n=87)	35.6%	35.6%	21.8%	6.9%	99.9%
$15,000-$19,999 (n=97)	21.7%	37.1%	27.8%	13.4%	100%
$10,000-$14,999 (n=69)	4.3%	27.5%	52.2%	15.9%	99.9%

(X^2=33.43 with 6 df; significant beyond .0001)

A significant relationship occurred between an engineer's salary level and job satisfaction (Table 49). Those engineers earning below $15,000 tended to state that they were "satisfied" with their present job situation. Engineers above $15,000 tended to be "above average" or

"highly satisfied" in terms of their present job situation. A significantly higher percentage of the "highly satisfied" engineers were at the $20,000 and above per year salary level.

Among respondents in this survey, engineer's salary, adjusted for job responsibilities, had a significant relationship with job satisfaction (Table 50). Those engineers who were below the median salary for their job responsibilities tended to state that they were "satisfied" with their present job situation. There was essentially no difference beween those engineers at or above the median salary for their job responsibilities. However, a significantly lower percentage of the "highly satisfied" engineers were below the median salary for their job responsibilities.

TABLE 50

The relationship between salary for job responsibilities and job satisfaction. (N=252)

Salary for Job Responsibilities	Degree of Satisfaction With Present Job Situation				
	Highly satisfied	(Above average)	Satisfied	Not satisfied	Total
Above the median (n=75)	26.7%	36.0%	26.7%	10.7%	100.1%
At the median (n=130)	25.4%	34.6%	29.2%	10.8%	100%
Below the median (n=47)	4.3%	27.7%	51.1%	17.0%	100.1%

(X^2=16.33 with 6 df; significant at .0121)

Table 51 illustrates the significant relationship between the number of salary increases and promotions an engineer received in the past two years and his job satisfaction. Those engineers who received over two salary increases and promotions tended to have a lower percentage "not satisfied" with their present job situation. Over half of the "highly satisfied" engineers had received three or more salary increases and promotions.

A significant relationship occurred between an engineer's level of supervisory responsibility and his job satisfaction (Table 52). A significantly higher percentage of those engineers in upper management stated they were "highly satisfied" in terms of their present

job situation. Of the respondents who stated they were "not satisfied" in their present job situation, 43% had no supervisory responsibility.

TABLE 51

The relationship between salary increases and promotions and job satisfaction. (N=252)

Number of Salary Increases and Promotions Received in Past Two Years	Degree of Satisfaction With Present Job Situation				
	Highly satisfied	(Above average)	Satisfied	Not satisfied	Total
Over 3 (n=24)	33.3%	37.5%	25.0%	4.2%	100%
Three (n=61)	36.1%	31.2%	26.2%	6.6%	100.1%
2-average (n=127)	13.4%	38.6%	37.0%	11.0%	100%
Zero or more (n=40)	17.5%	22.5%	35.0%	25.0%	100%

(X^2=20.20 with 9 df; significant at .0167)

TABLE 52

The relationship between level of supervisory responsibility and job satisfaction. (N=255)

Level of Supervisory Responsibility (see level description following table)	Degree of Satisfaction With Present Job Situation				
	Highly satisfied	(Above average)	Satisfied	Not satisfied	Total
5 (n=26)	76.6%	19.2%	3.9%	0%	100%
4 (n=19)	15.8%	47.4%	36.8%	0%	100%
3 (n=91)	20.9%	38.5%	34.1%	6.6%	100.1%
2 (n=47)	12.8%	31.9%	31.9%	23.4%	100%
1 (n=72)	9.7%	31.9%	40.3%	18.1%	99.9%

(X^2=60.71 with 12 df; significant beyond .0001)

Level description:

5. Executive—upper management.
4. Supervision of lower and/or middle management.
3. Supervision of engineering and/or scientific personnel.
2. Supervision of technical and/or nontechnical, except engineering or scientific.
1. No supervisory responsibility.

There was a significant relationship between an engineer's level of technical responsibility and his job satisfaction (Table 53). The very few engineers at the highest technical level tended to be "highly satisfied" in terms of their present job situation. The majority of engineers at the middle technical level tended to be "satisfied" or above with their present job situation.

TABLE 53

The relationship between level of technical responsibility and job satisfaction. (N=252)

Level of Technical Responsibility (see level description below)	Degree of Satisfaction With Present Job Situation				
	Highly satisfied	(Above average)	Satisfied	Not satisfied	Total
(n=10)	70.0%	10.0%	20.0%	0%	100%
4 (n=61)	29.5%	45.9%	23.0%	1.6%	100%
3 (n=133)	16.5%	32.3%	36.1%	15.0%	99.9%
2 or 1 (n=48)	12.5%	29.2%	39.6%	18.7%	100%

(X^2=26.45 with 9 df; significant at .0017)

Level description:

5. Original research or engineering development on unknown blocks of data.
4. Independent work in extending known engineering techniques, data, etc.
3. Independent performance of most work with directions only as to general results expected.

Combined Response:

2. Performance of assignments with limited directions with a general review of work done.
1. Performance of limited assignments with specific direction under an experienced engineer.

When an engineer's job satisfaction was compared to the overall emphasis his company placed on continuing education, a significant relationship occurred (Table 54). Those engineers from companies placing an overall average or above emphasis on continuing education tended to be "highly satisfied" or "above average" in satisfaction with their present job situation. However, those engineers from companies placing an overall below average emphasis on continuing education tended to be average or below in their job satisfaction. Of the factors (defined in Chapter 3) comprising overall company emphasis on continuing education, three had individual significant relationships with job satisfaction. Those three factors were:

1. Company emphasis placed on providing released time for attending credit courses.
2. Company emphasis placed on professional society or government-sponsored programs.
3. Company emphasis placed on in-house programs.

The relationship between a company's emphasis on university noncredit programs and an engineer's job satisfaction was significant only at the .05 level.

TABLE 54

The relationship between overall company emphasis placed on continuing education and job satisfaction. (N=247)

Overall Company Emphasis Placed on Continuing Education	Degree of Satisfaction With Present Job Situation				
	Highly satisfied	(Above average)	Satisfied	Not satisfied	Total
High emphasis (n=53)	39.6%	37.7%	20.8%	1.9%	100%
Average emphasis (n=132)	20.5%	39.4%	30.3%	9.8%	100%
Low emphasis (n=62)	9.6%	19.4%	45.2%	25.8%	100%

(X^2=37.50 with 6 df; significant beyond .001)

Table 55 gives the significant relationship which occurred between an engineer's job satisfaction and the emphasis his company placed on providing released time for attending credit courses. Those engineers who came from companies which placed a low emphasis on providing released time had a significantly higher percentage stating they were "not satisfied" with their present job situation. Engineers who stated they were "highly satisfied" tended to come from companies which placed high emphasis on providing released time for credit courses.

TABLE 55

The relationship between company emphasis placed on providing released time for attending credit courses and job satisfaction. (N=244)

Company Emphasis Placed on Providing Released Time for Attending Credit Courses	Degree of Satisfaction With Present Job Situation				
	Highly satisfied	(Above average)	Satisfied	Not satisfied	Total
High emphasis (n=84)	28.6%	44.1%	19.1%	8.3%	100.1%
Average emphasis (n=54)	25.9%	42.6%	25.9%	5.6%	100%
Low emphasis (n=106)	15.1%	23.6%	45.3%	16.0%	100%

(X^2=26.40 with 6 df; significant at .0002)

There was a significant relationship between an engineer's job satisfaction and the emphasis his company placed on professional society or government-sponsored programs (Table 56). Those engineers with companies placing a low emphasis on professional society or government-sponsored programs had a significantly higher percentage stating they were "not satisfied" with their present job situation. Of those engineers from companies placing high emphasis on the above programs, the majority were "above average" or "highly satisfied" in terms of their present job situation.

A significant relationship occurred between an engineer's job satisfaction and the emphasis his company placed on in-house programs (Table 57). Those engineers from companies placing high emphasis on in-house programs tended to have a higher percentage stating they were "highly satisfied" with their present job situation. Of the engineers from companies with low emphasis, a majority tended to be "satisfied" or "not satisfied" with their present job situation.

TABLE 56

The relationship between company emphasis placed on professional society or government-sponsored programs and job satisfaction. (N=250)

Company Emphasis Placed on Professional Society or Government-sponsored Programs	Degree of Satisfaction With Present Job Situation				
	Highly satisfied	(Above average)	Satisfied	Not satisfied	Total
High emphasis (n=56)	37.5%	41.1%	19.6%	1.8%	100%
Average emphasis (n=95)	18.9%	40.0%	32.6%	8.4%	99.9%
Low emphasis (n=99)	15.2%	24.2%	39.4%	21.2%	100%

(X^2=30.56 with 6 df; significant beyond .0001)

TABLE 57

The relationship between company emphasis on in-house programs and job satisfaction. (N=254)

Company Emphasis Placed on In-House Programs	Degree of Satisfaction With Present Job Situation				
	Highly satisfied	(Above average)	Satisfied	Not satisfied	Total
High emphasis (n=91)	29.7%	36.3%	28.6%	5.5%	100%
Average emphasis (n=94)	17.0%	35.1%	37.2%	10.6%	99.9%
Low emphasis (n=69)	17.4%	29.0%	31.9%	21.7%	100%

(X^2=14.92 with 6 df; significant at .0209)

The relationship between a company's emphasis placed on university noncredit programs and an engineer's job satisfaction was significant only at the .05 level (Table 58). Those engineers from companies with high emphasis tended to have a lower percentage stating they were "not satisfied" with their current job situation; however, there were no significant differences within the relationship.

85

TABLE 58

The relationship between company emphasis on university noncredit programs and job satisfaction. (N=249)

Company Emphasis Placed on University Noncredit Programs	Degree of Satisfaction With Present Job Situation				
	Highly satisfied	(Above average)	Satisfied	Not satisfied	Total
High emphasis (n=72)	29.2%	37.5%	29.2%	4.1%	100%
Average emphasis (n=93)	18.3%	38.7%	31.2%	11.8%	100%
Low emphasis (n=84)	19.1%	26.2%	35.7%	19.1%	100.1%

($X^2=12.6$ with 6 df; significant at .05)

Reference

[1]Sidney Siegel, *Nonparametric Statistics for the Behavioral Sciences* (New York: McGraw-Hill Book Company, 1956), p. 178.

Appendix A

QUESTIONNAIRE

387

UNIVERSITY OF WISCONSIN-EXTENSION
432 NORTH LAKE STREET MADISON, WISCONSIN 53706

Department of Engineering
Tel: (608) 262-2061

March, 1974

THE ENGINEER AND CONTINUING EDUCATION

- -

Dear Colleague in Engineering:

The University of Wisconsin is rededicating itself to The Wisconsin Idea - - the taking of education to the people. However, we need information and guidance from you.

As a participant in this institute, your input would be very helpful in updating our programs to meet the changing demands of engineers and the challenge of technology. If you have a degree in an engineering area, we hope you will take a few minutes to complete this survey - to give us information concerning your experiences in continuing education and other factors in your work. The returns will be kept in strict confidence and no use will be made of data which in any way might identify an individual respondent.

Help us do a better job for you. Please complete the survey and it will be picked up at today's program.

Thank you for your cooperation.

John P. Klus, Chairman

UNIVERSITY OF WISCONSIN-EXTENSION
432 NORTH LAKE STREET MADISON WISCONSIN 53706

Department of Engineering
Tel: (608) 262-2061

THE ENGINEER AND CONTINUING EDUCATION

A Survey of Engineers Enrolled in Extension Programs

1974

Please answer all questions completely; NO identification is requested; ALL information is strictly confidential.

1. What is the approximate number of people employed by your company, including all divisions? _____

2. What is the approximate number of engineers employed in your division only? _____

3. What is your age? _____

4. How many years have you been employed by your present company? _____

5. Please check whichever ONE best describes your present level of SUPERVISORY responsibility:

   _____No supervisory responsibility

   _____Supervision of technical and/or non-technical personnel EXCEPT engineering and scientific

   _____Supervision of engineering and/or scientific personnel

   _____Supervision of lower and/or middle management personnel

   _____Executive (upper management)

6. Following is a list of some activities in which engineers might be engaged. Please check your present degree of involvement in each:

HIGHLY INVOLVED	SOMEWHAT INVOLVED	NOT INVOLVED	
_____	_____	_____	Research and Development
_____	_____	_____	Management - engineering, production, project
_____	_____	_____	Manufacturing Engineering
_____	_____	_____	Sales and/or Marketing
_____	_____	_____	Field Service Engineering - application
_____	_____	_____	Consulting
_____	_____	_____	Design and Drafting
_____	_____	_____	Quality Control
_____	_____	_____	Inventory Control - scheduling
_____	_____	_____	Project Engineering - cost control, purchasing, preparing bids
_____	_____	_____	Planning - long or short range
_____	_____	_____	Packaging
_____	_____	_____	Safety
_____	_____	_____	Specifications - codes, standards
_____	_____	_____	Computer utilization and Data Processing
_____	_____	_____	Industrial Engineering
_____	_____	_____	Maintenance
_____	_____	_____	Plant layout and/or Equipment installation
_____	_____	_____	Training and/or Evaluation of Personnel
_____	_____	_____	Other_____

7. Please check whichever ONE best describes your present level of TECHNICAL responsibility:

_____Perform limited assignments with specific direction under an experienced engineer

_____Perform assignments with limited directions, with a general review of work done

_____Independently perform most work with directions only to general results expected

_____Independent work in extending known engineering techniques, data, etc.

_____ORIGINAL research or engineering development on unknown blocks of data

HIGH MEDIUM LOW

8. In relation to the other means you use for your own self-education, what degree of emphasis do you place on reading current engineering and technical literature? (Please circle ONE)

5 4 3 2 1

9. What degree of emphasis have you placed on establishing professional relationships with engineers in other companies for the informal exchange of information as problems arise? (Please circle ONE)

5 4 3 2 1

10. How many credit courses, excluding work toward an undergraduate degree, have you successfully completed at a college or university during the past 2 years? _____

11. How many in-house educational (training) courses, seminars or conferences have you participated in during the past 2 years? _____

12. How many conferences, institutes, or short courses, conducted by a university or university extension, have you participated in during the past 2 years (including this one)? _____

13. How many seminars, institutes or short courses, conducted by professional societies or the government, have you participated in during the past 2 years? _____

14. How many correspondence courses have you completed in the past 2 years? _____

15. Please check whichever range best approximates your present annual salary:

_____Below $10,000

_____$10,000 - $14,999

_____$15,000 - $19,999

_____$20,000 or above

HIGHLY SATISFIED				NOT SATISFIED	
5	4	3	2	1	16. In terms of your present job situtation are you: (Please circle ONE)

17. How many salary increases and promotions have you received in the past 2 years? _____

HIGH		MEDIUM		LOW	
					18. The degree of emphasis placed by my present company on the following is:
5	4	3	2	1	A. Educational (training) programs - formal courses, specific content meetings, conferences, intra-department meetings, etc. - within the company
5	4	3	2	1	B. Company sponsored programs out of plant - UNIVERSITY OR UNIVERSITY EXTENSION programs
5	4	3	2	1	C. Other company sponsored programs out of plant - Professional seminars, government courses, etc.
					19. My present company provides the following kinds of support and encouragement for courses taken for credit at a college or university by:
5	4	3	2	1	A. Tuition refunds
5	4	3	2	1	B. Refunding the cost of books, supplies, etc.
5	4	3	2	1	C. Released time from work
5	4	3	2	1	D. Special recognition upon completion of courses (presentation of certificate, article in company newspaper, etc.)
5	4	3	2	1	E. Promotion and/or raise
					20. The value to me in terms of my career advancement of my past participation in the following was:
5	4	3	2	1	A. Educational (training) programs within companies
5	4	3	2	1	B. University & University Extension programs
5	4	3	2	1	C. Professional seminars, government courses, etc.
5	4	3	2	1	D. Courses taken for credit at a college or university
5	4	3	2	1	21. To what degree were your on-the-job activities, as opposed to programs within companies, useful in preparing you for your career advancement?
5	4	3	2	1	22. To what degree were your educational programs taken off company location, as opposed to in-house programs, useful in preparing you for your career advancement?

Appendix B

INITIAL TABULATION OF SURVEY

Question 1. What is the approximate number of people employed by your company, including all divisions? See Table 1, page 17.

Question 2. What is the approximate number of engineers employed in your division only? See Table 2, page 18.

Question 3. What is your age? See Table 3, page 18.

Question 4. How many years have you been employed by your present company?

Years	Percent	Number responding
0-2	25.7	66
3-5	22.2	57
6-10	24.1	62
11-20	19.1	49
21-39	8.9	23
	100.0	257

Question 5. Please check whichever **ONE** best describes your present level of SUPERVISORY responsibility:

	Percent	Number
No supervisory responsibility	28.4	73
Supervision of technical and/or non-technical personnel—EXCEPT engineering and scientific	18.3	47
Supervision of engineering and/or scientific personnel	35.8	92
Supervision of lower and/or middle management personnel	7.4	19
Executive (upper management)	10.1	26
	100.0	257

Question 6. Following is a list of some activities in which engineers might be engaged. Please check your present degree of involvement in each:

	HIGHLY INVOLVED		SOMEWHAT INVOLVED		NOT INVOLVED	
	%	No.	%	No.	%	No.
Research and development	19.8	51	42.0	108	37.4	96
Management—engineering, production, project	39.3	101	34.2	88	25.7	66
Manufacturing engineering	24.9	64	23.3	60	51.0	131
Sales and/or marketing	11.3	29	19.5	50	68.5	176

	HIGHLY INVOLVED		SOMEWHAT INVOLVED		NOT INVOLVED	
	%	No.	%	No.	%	No.
Field service engineering—application	8.2	2	28.4	73	62.6	161
Consulting	17.5	45	24.5	63	57.2	147
Design and drafting	23.3	60	35.8	92	40.1	103
Quality control	7.4	19	40.9	105	51.0	131
Inventory control—scheduling	5.8	15	21.8	56	71.6	184
Project engineering—cost control, purchasing, preparing bids	25.7	66	40.5	104	33.1	85
Planning—long or short range	25.3	65	46.7	120	27.2	70
Packaging	10.1	26	20.2	52	68.9	177
Safety	10.9	28	41.2	106	47.1	121
Specifications—codes, standards	19.1	49	44.4	114	35.8	92
Computer utilization and data processing	9.7	25	38.5	99	51.0	131
Industrial engineering	20.2	52	21.4	55	57.6	148
Maintenance	7.4	19	23.3	60	68.5	176
Plant layout and/or equipment installation	15.6	40	28.0	72	55.6	143
Training and/or evaluation of personnel	15.2	39	39.7	102	44.4	114
Other	6.2	16	0.8	2	92.2	237

Question 7. Please check whichever ONE best describes your present level of TECHNICAL responsibility:

	Percent	Number
Perform limited assignments with specific direction under an experienced engineer	1.9	5
Perform assignments with limited directions, with a general review of work done	16.7	43
Independently perform most work with directions only to general results expected	52.5	135
Independent work in extending known engineering techniques, data, etc.	23.7	61

	Percent	Number
ORIGINAL research or engineering development on unknown blocks of data	3.9	10
No answer	1.2	3
	99.9	257

Question 8. In relation to the other means you use for your own self-education, what degree of emphasis do you place on reading current engineering and technical literature? (Please circle ONE)

Emphasis:	Percent	Number
1 (low)	2.3	6
2	9.7	25
3 (medium)	33.5	86
4	35.8	92
5 (high)	18.7	48
	100.0	257

Question 9. What degree of emphasis have you placed on establishing professional relationships with engineers in other companies for the informal exchange of information as problems arise? (Please circle ONE)

Emphasis:	Percent	Number
1 (low)	16.3	42
2	20.2	52
3 (medium)	26.8	69
4	21.0	54
5 (high)	15.6	40
	99.9	257

Question 10. How many credit courses, excluding work toward an undergraduate degree, have you successfully completed at a college or university during the past 2 years?

Credit courses:	Percent	Number
0	82.1	211
1	5.1	13
2	3.5	9
3	2.7	7
4	1.2	3
5	1.2	3
Over 5	4.3	11
	100.1	257

Question 11. How many in-house educational (training) courses, seminars, or conferences have you participated in during the past 2 years?

In-house programs:	Percent	Number
0	26.5	68
1	19.8	51
2	19.8	51
3	10.5	27
4	11.3	29
5	3.5	9
6	2.7	7
7	1.2	3
8	1.2	3
Over 8	3.6	9
	100.1	257

Question 12. How many conferences, institutes, or short courses, conducted by a university or university extension, have you participated in during the past 2 years (including this one)?

University programs:	Percent	Number
1	52.1	134
2	24.1	62
3	12.8	33
4	7.8	20
5	1.6	4
Over 5	1.6	4
	100.0	257

Question 13. How many seminars, institutes, or short courses, conducted by professional societies or the government, have you participated in during the past 2 years?

Professional society or government programs:	Percent	Number
0	44.7	115
1	19.5	50
2	18.3	47
3	7.0	18
4	4.3	11
5	3.5	9
6	0.8	2
Over 6	2.0	5
	100.1	257

Question 14. How many correspondence courses have you completed in the past 2 years?

Correspondence courses:	Percent	Number
0	93.4	240
1	5.8	15
2	0.4	1
3	0.4	1
	100.0	257

Question 15. Please check whichever range best approximates your present annual salary:

	Percent	Number
Below $10,000	0.4	1
$10,000-$14,999	26.5	68
$15,000-$19,999	38.5	99
$20,000 or above	33.9	87
No answer	0.8	2
	100.1	257

Question 16. In terms of your present job situation are you:

	Percent	Number
1 (Not satisfied)	3.1	8
2	8.6	22
3 (Satisfied)	32.3	83
4	33.9	87
5 (Highly satisfied)	21.4	55
No answer	0.8	2
	100.1	257

Question 17. How many salary increases and promotions have you received in the past 2 years?

Salary increases and promotions	Percent	Number
0	2.3	6
1	13.2	34
2	49.8	128
3	23.7	61
4	7.0	18
5	1.2	3
6	1.2	3
No answer	1.6	4
	100.0	257

Question 18. The degree of emphasis placed by my present company on the following is

A. Educational (training) programs—formal courses, specific content meetings, conferences, intradepartment meetings, etc.—within the company.

Emphasis:	Percent	Number
1 (Low)	8.9	23
2	17.9	46
3 (Medium)	37.0	95
4	23.7	61
5 (High)	11.7	30
No answer	0.8	2
	100.0	257

B. Company-sponsored programs out of plant—UNIVERSITY OR UNIVERSITY EXTENSION programs

Emphasis:	Percent	Number
1 (Low)	14.4	37
2	18.3	47
3 (Medium)	36.6	94
4	19.1	49
5 (High)	8.9	23
No answer	2.7	7
	100.0	257

C. Other company-sponsored programs out of plant—professional seminars, government courses, etc.

Emphasis:	Percent	Number
1 (Low)	17.1	44
2	21.8	56
3 (Medium)	37.0	95
4	14.0	36
5 (High)	7.8	20
No answer	2.3	6
	100.0	257

Question 19. My present company provides the following kinds of support and encouragement for courses taken for credit at a college or university by:

A. Tuition refunds

Support:	Percent	Number
1 (Low)	6.6	17
2	1.6	4
3 (Medium)	9.7	25
4	24.1	62
5 (High)	54.9	141
No answer	3.1	8
	100.0	257

B. Refunding the cost of books, supplies, etc.

Support:	Percent	Number
1 (Low)	32.3	83
2	5.4	14
3 (Medium)	10.5	27
4	17.1	44
5 (High)	29.2	75
No answer	5.4	14
	99.9	257

C. Released time from work

Support:	Percent	Number
1 (Low)	24.1	62
2	17.1	44
3 (Medium)	21.4	55
4	11.7	30
5 (High)	21.0	54
No answer	4.7	12
	100.0	257

D. Special recognition upon completion of courses (presentation of certificate, article in company newspaper, etc.)

Support:	Percent	Number
1 (Low)	40.5	104
2	20.6	53
3 (Medium)	14.8	38
4	10.9	28
5 (High)	5.8	15
No answer	7.4	19
	100.0	257

E. Promotion and/or raise

Support:	Percent	Number
1 (Low)	31.9	82
2	23.7	61
3 (Medium)	28.0	72
4	6.6	17
5 (High)	2.7	7
No answer	7.0	18
	99.9	257

Question 20. The value to me in terms of my career advancement of my past participation in the following was:

A. Educational (training) programs within companies

Value:	Percent	Number
1 (Low)	20.6	53
2	15.2	39
3 (Medium)	34.2	88
4	15.6	40
5 (High)	6.2	16
No answer	8.2	21
	100.0	257

B. University and university extension programs

Value:	Percent	Number
1 (Low)	10.9	28
2	16.3	42
3 (Medium)	32.3	83
4	20.2	52
5 (High)	11.7	30
No answer	8.6	22
	100.0	257

C. Professional seminars, government courses, etc.

Value:	Percent	Number
1 (Low)	19.5	50
2	20.2	52
3 (Medium)	33.1	85
4	12.8	33
5 (High)	6.2	16
No answer	8.2	21
	100.0	257

D. Courses taken for credit at a college or university

Value:	Percent	Number
1 (Low)	24.1	62
2	14.8	38
3 (Medium)	16.7	43
4	14.4	37
5 (High)	17.5	45
No answer	12.5	32
	100.0	257

Question 21. To what degree were your on-the-job activities, as opposed to programs within companies, useful in preparing you for your career advancement?

Degree:	Percent	Number
1 (Low)	1.6	4
2	5.1	13
3 (Medium)	21.0	54
4	41.6	107
5 (High)	27.6	71
No answer	3.1	8
	100.0	257

Question 22. To what degree were your educational programs taken off company location, as opposed to in-house programs, useful in preparing you for your career advancement?

Degree:	Percent	Number
1 (Low)	8.9	23
2	17.1	44
3 (Medium)	33.1	85
4	24.5	63
5 (High)	11.3	29
No answer	5.1	13
	100.0	257